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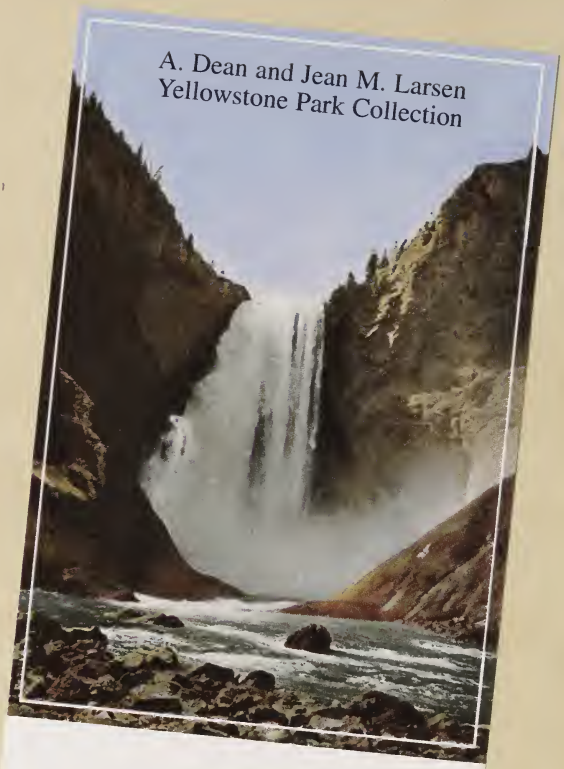

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MANUAL OF THE BOTANY

OF THE

ROCKY MOUNTAIN REGION.

MANUAL OF THE BOTANY

(PHÆNOGAMIA AND PTERIDOPHYTA)

OF THE

ROCKY MOUNTAIN REGION,

FROM NEW MEXICO TO THE BRITISH BOUNDARY.

BY

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PREFACE.

This manual is intended to do for its own range what has been for a long time so admirably done for the Northeastern States by Dr. Gray's Manual. About ten years ago it was the writer's privilege to assist Professor Porter in the preparation of the *Synopsis of the Flora of Colorado*, a first attempt to bring together in convenient shape, for a restricted region, the scattered material of our Western collectors. The demand even then for a book by no means complete or conveniently arranged was unexpected, and in the wonderful development of the decade since then lies the confidence that a more convenient book covering a greater range will be welcome to many. The difficulties attending the naming of Western plants, owing to the fact that descriptions are scattered through numerous and often inaccessible publications, can only be appreciated by those who have attempted it. From this fact, a great stimulus to the study of systematic botany has been lacking, collectors have been almost entirely professional, and a thousand possible streams of information have been reduced to a score.

West of the Mississippi Valley prairie region, which is but the continuation of more eastern conditions, there are three well-defined floras. One is that of the Pacific slope; another is Mexican in character, extending from the Great Basin to Arizona, New Mexico, Western Texas, and southward into Mexico; the third is the Rocky Mountain region, extending eastward across the plains to the prairies.

The first region is well provided for in the two volumes of the *Botany of California*. The second, in the Great Basin, has

Sereno Watson's *Botany of the 40th Parallel*, and in its Arizona and New Mexican section, Dr. Rothrock's *Botany of the Wheeler Survey*. The third region is that which this manual attempts to provide for, its only predecessor being the *Synopsis of the Flora of Colorado*, already referred to. Essentially, therefore, the range includes Colorado, Wyoming, Montana, Western Dakota, Western Nebraska, and Western Kansas, the hundredth meridian representing very nearly the eastern boundary. While this is true, the larger part of contiguous floras also will be found described, so that the western part of the Indian Territory, Northwestern Texas, Northern New Mexico and Arizona, and Eastern Utah and Idaho, may be included for all except their own peculiar plants. In Utah, our range is naturally carried westward by the Uinta and Wahsatch Mountains, whose plants are intended to be included.

This edition only claims to be a compilation, an orderly arrangement and sifting of scattered material. The chief reason is, that first editions are necessarily incomplete, and that materials for the satisfactory presentation of a flora most quickly come from the provocation of an incomplete edition. The author will therefore esteem it the surest evidence of the usefulness of this book, if in the abundance of corrections called forth a more complete edition may be attempted at an early day.

It is unnecessary to give all the sources of descriptions and information, as it would simply be a catalogue of the very numerous contributions to western botany. The professional botanist will notice that descriptions have been chiefly obtained from the *Botany of California*, *Botany of King's Expedition*, and Eaton's *Ferns of North America*, all constantly influenced by Gray's *Manual;* and that the presentation of Gamopetalæ is little more than a culling from Dr. Gray's recent volumes of the *Synoptical Flora of North America*. As in most cases descriptions and synoptical arrangement could be obtained from the writings of Dr. Gray, Mr. Watson, and Professor Eaton, little more is attempted in this edition than to adapt these descriptions to the spirit of the work with as little change as

possible. To Dr. Gray is due, not only the thought which grew into this book, but also a constant encouragement and patient criticism which have developed anything of merit it possesses. Mr. Watson has also responded generously to every demand made upon him; while to Messrs. M. S. Bebb and L. H. Bailey, Jr. is due the relief of some original work, the former being our well-known authority in the difficult genus *Salix*, and the latter an ardent and most successful student of the perplexing genus *Carex*. At the time of his death, Dr. George Engelmann had in preparation the groups with which his name is so closely connected, and their presentation shows the lack of his master hand.

In general, the ordinal sequence adopted by Bentham and Hooker's *Genera Plantarum* has been followed, but Gymnosperms have been transferred to the end of Phænogams, and Monocotyledons and Dicotyledons subordinated to Angiosperms. This change has been made simply because it better expresses relationships which have long been recognized. The term "Crỳptogam" has been discarded as the correlative of Phænogam, and Pteridophyta (Vascular Cryptogams) is used as the name of the second great series of plants. The orders and ordinal sequence of the Pteridophyta are thought best to express their relationships.

Introduced plants are placed in foot-notes, that they may be separated as far as possible from our native plants, and their relation to the flora thus emphasized.

To save space, there is no attempt to give any but the most important references and synonymy, while geographical range is reduced to its lowest terms, and collectors' names almost entirely omitted. For the most part no characters have been repeated, and the student is warned that generic characters especially must be sought for through analytical keys. The professional botanist will note a glaring inconsistency in this respect, the genera of some families being grouped by means of a few very salient characters, while those of others are presented with almost full descriptions, only certain supplementary statements being left to head the descriptions of

species. It is sufficient to say that the two methods hold the relation to each other of former and latter in the preparation of this book.

In groups of species certain contrasting characters have been italicized, according to the method of Gray's Manual. This is done to facilitate the work of the student, but with the mental reservation that its abuse may more than offset its advantage. Ten years' experience as a teacher has shown that the ordinary student will fix his attention upon the italicized characters to the neglect of the description as a whole. The student is here warned that the specific descriptions in this book have been so much reduced that no unimportant characters are intended to be given.

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January 1, 1885.

ANALYTICAL KEY TO THE ORDERS.

SERIES I. PHÆNOGAMIA OR FLOWERING PLANTS. Those with flowers and seeds.

CLASS I. ANGIOSPERMÆ. Pistil a closed ovary containing the ovules.

SUBCLASS I. DICOTYLEDONS. Embryo with two cotyledons. Leaves netted-veined. Flowers usually 4 or 5-merous.

DIVISION I. POLYPETALÆ. Calyx and corolla both present: the latter of separate petals.

A. *Stamens numerous, at least more than* 10, *and more than twice the petals.*

1. *Stamens on the receptacle, free from the ovary and calyx.*

Pistils few to many distinct carpels. . . . . RANUNCULACEÆ, 1
Pistil compound: cells, placentæ, or stigmas more than one.
  Petals more numerous than sepals,
    Very numerous, small and persistent: aquatic. . . NYMPHÆACEÆ, 3
    Twice as many (4 or 6), and both usually caducous. PAPAVERACEÆ, 4
    Five to sixteen: sepals persistent. . . . PORTULACACEÆ, 12
  Petals same number as sepals,
    Four, and both deciduous. . . . . CAPPARIDACEÆ, 7
    Five, and the calyx persistent.
      Sepals valvate in the bud: stamens monadelphous. MALVACEÆ, 15
      Sepals imbricated in the bud: leaves entire and pellucid-punctate. . . . . HYPERICACEÆ, 14

2. *Stamens on the (free or adnate) calyx.*

Leafless mostly prickly fleshy plants: ovary 1-celled. . . CACTACEÆ, 34
Leafy fleshy plants: ovary 3 or more-celled. . . . FICOIDEÆ, 35
Leafy fleshy herbs: ovary 1-celled. . . . . PORTULACACEÆ, 12
Not fleshy.
  Leaves opposite, simple: sepals and petals 4 or 5. . SAXIFRAGACEÆ, 27
  Leaves alternate, with stipules. . . . . ROSACEÆ, 26
  Leaves alternate, without stipules, rough. . . . LOASACEÆ, 32

B. *Stamens 10 or less, or at most not more than twice the petals.*

1. *Ovary or ovaries superior or mainly so.*

* *Pistils more than one, and distinct.*

Pistils same number as petals and as sepals: leaves fleshy. CRASSULACEÆ, 98
Pistils not same number as petals or sepals.
Stamens on the receptacle. . . . . RANUNCULACEÆ, 1
Stamens on the calyx.
Stipules persistent: leaves alternate. . . . . ROSACEÆ, 26
Stipules none or indistinct. . . . . SAXIFRAGACEÆ, 27

* * *Pistil only one.*

+ *Pistil simple, as shown by the single style, stigma, and cell.*

Anthers opening by uplifted valves or transversely. . BERBERIDACEÆ, 2
Anthers opening lengthwise or at the top.
Flowers irregular, or leaves twice pinnate: fruit a legume. LEGUMINOSÆ, 25
Flowers irregular: leaves simple. . . . . POLYGALACEÆ, 9
Flowers regular: leaves mostly stipulate: fruit a drupe or akene. . . . . ROSACEÆ, 26

+ + *Pistil compound, as shown by the number of cells or placentæ, styles or stigmas.*

Ovary 1-celled, with (2 to 4, rarely more) parietal placentæ.
Petals (long-clawed) and teeth of long-tubular calyx 4 or 5. . . . . FRANKENIACEÆ, 10
Petals and sepals or lobes of the cleft calyx 5.
Corolla irregular: lower petal spurred. . . . VIOLACEÆ, 8
Corolla regular or nearly so: styles or stigmas entire. SAXIFRAGACEÆ, 27
Petals 4: bract-like sepals 2: flower irregular. . . FUMARIACEÆ, 5
Petals and sepals each 4: stameps 6. . . . CAPPARIDACEÆ, 7
Ovary and pod 2-celled: 2 parietal placentæ: stamens tetradynamous. . . . . CRUCIFERÆ, 6
Ovary and capsule 1-celled, several to many-seeded on a central placenta,
Truly so; the partitions wanting or very incomplete.
Sepals 2: leaves often alternate. . . . PORTULACACEÆ, 12
Sepals or calyx-lobes 5 or 4: leaves all opposite. CARYOPHYLLACEÆ, 11
Apparently so; the partitions at length vanishing.
Stipules between the opposite leaves. . . . ELATINACEÆ, 13
No stipules. . . . . LYTHRACEÆ, 30
Ovary and fruit 1-celled, with a single seed on a stalk from the base.
Shrubs: styles or stigmas 3: fruit drupe-like. ANACARDIACEÆ, 24
Herbs: style at most 2-cleft: fruit a utricle. ILLECEBRACEÆ, 63
Ovary more than 1-celled: seeds attached to the axis, or base, or summit.
Flowers very irregular: ovary 2-celled: cells 1-seeded. POLYGALACEÆ, 9
Flowers regular or nearly so.
No green foliage. . . . . Monotropeæ, etc., in ERICACEÆ, 45
Foliage pellucid-punctate: strong-scented shrubs. . RUTACEÆ, 19
Foliage not pellucid-punctate.
Anthers opening by terminal chinks or pores. . . ERICACEÆ, 45

Anthers opening lengthwise.
Stamens as many as the petals, and opposite them.
Calyx-lobes valvate in the bud. . . . RHAMNACEÆ, 21
Calyx-lobes small or obsolete: petals valvate. . VITACEÆ, 22
Stamens when just as many as petals alternate with them.
Strong-scented shrub: leaves opposite, 2-foliolate. . . . . ZYGOPHYLLACEÆ, 17
Strong-scented herbs: leaves lobed or compound. GERANIACEÆ, 18
Herbs, not strong-scented.
Ovules 1 to 4 in each cell.
Leaves all simple and entire. . . . LINACEÆ, 16
Leaves all opposite, compound, and leaflets entire. . . . . ZYGOPHYLLACEÆ, 17
Leaves alternate or opposite, the latter with divisions or leaflets not entire. . GERANIACEÆ, 18
Ovules numerous.
Stamens on the calyx: styles 2 or 3. SAXIFRAGACEÆ, 27
Stamens on the receptacle: leaves opposite, simple.
Cells of the ovary as many as the sepals, 2 or 5. . . . . ELATINACEÆ, 13
Cells fewer than the sepals, 3. Mollugo, in FICOIDEÆ, 35
Shrubs or trees with opposite simple leaves.
Leaves pinnately veined, not lobed. . . CELASTRACEÆ, 20
Leaves palmately veined, lobed. . . . SAPINDACEÆ, 23
Shrubs or trees with opposite compound leaves.
Stamens 4 to 8. . . . . SAPINDACEÆ, 23
Stamens 2 or rarely 3. . . . . OLEACEÆ, 47

2. *Ovary and fruit inferior or mainly so.*

Tendril-bearing herbs: flowers monœcious or diœcious. CUCURBITACEÆ, 33
Aquatic herbs: flowers diœcious or monandrous. HALORAGEÆ, 29
Shrubs or herbs, not tendril-bearing nor diœcious, nor umbelliferous.
Stamens as many as the small or unguiculate petals and opposite them. . . . . RHAMNACEÆ, 21
Stamens if of the number of the petals alternate with them.
Styles 2 to 5, distinct or united below.
Fruit a few-seeded pome. . . . . ROSACEÆ, 26
Fruit a many-seeded capsule. . . . . SAXIFRAGACEÆ, 27
Fruit a 1-celled many-seeded berry. . Ribes, in SAXIFRAGACEÆ, 27
Style 1, undivided: stigmas 1 to 4.
Flowers in cymes or a glomerate cluster. . CORNACEÆ, 38
Flowers racemose, spicate, or axillary.
Ovary 1-celled: herbage scabrous. . . . LOASACEÆ, 32
Ovary 2 to 5-, mostly 4-celled. . . . ONAGRACEÆ, 31
Herbs: flowers in umbels: styles 2: fruit dry. . . UMBELLIFERÆ, 36
Herbs or shrubs: flowers in umbels: styles 4 or 5: fruit berry-like. . . . . ARALIACEÆ, 37

DIVISION II. GAMOPETALÆ. Petals more or less united into one piece.

A. *Ovary inferior, or mostly so.*

Stamens more numerous than the lobes of the corolla, 8 or 10, distinct. . . . . ERICACEÆ, 45
Stamens as many as the lobes of the corolla, 5 (or 4), syngenesious.
Flowers in an involucrate head. . . . . COMPOSITÆ, 42
Flowers separate, racemose or spicate. . . . . LOBELIACEÆ, 43
Stamens as many as the corolla lobes (at least 4), distinct,
Nearly or quite free from the corolla: leaves alternate: no stipules. . . . . CAMPANULACEÆ, 44
Inserted on the corolla: leaves opposite or whorled,
With stipules, or else in whorls, quite entire. . . RUBIACEÆ, 40
Without stipules, opposite. . . . . CAPRIFOLIACEÆ, 39
Stamens only 3, fewer than the lobes of the corolla.
Leaves opposite: stamens distinct. . . . VALERIANACEÆ, 41
Leaves alternate: stamens often united. . . . CUCURBITACEÆ, 33

B. *Ovary superior (free), or mostly so.*

1. *Stamens more numerous than the lobes of the corolla.*

Pistil single and simple: leaves compound. . . . LEGUMINOSÆ, 25
Pistil compound, with one undivided style. . . . . ERICACEÆ, 45

2. *Stamens as many as the lobes of the corolla and opposite them.*

Style 1: ovary and capsule several to many-seeded. . . PRIMULACEÆ, 46

3. *Stamens as many as the lobes of the corolla, and alternate with them, or fewer.*

* *No green herbage.*

Corolla regular: stamens free: seeds very many and minute. . . . . Monotropeæ, in ERICACEÆ, 45
Corolla regular: stamens on the tube: fruit 2-celled. Cuscuta, in CONVOLVULACEÆ, 54
Corolla irregular: stamens didynamous: capsule 1-celled, many-seeded. . . . . OROBANCHACEÆ, 57

* * *With ordinary green herbage.*

+ *Corolla regular or nearly so: stamens not didynamous.*

Corolla scarious and veinless: stemless herbs. . . PLANTAGINACEÆ, 61
Corolla more or less veiny.
Stamens 2 or 3: parts of the corolla 4 or 5. . . . OLEACEÆ, 47
Stamens 5 (or 4), as many as the corolla-lobes.
Pollen in solid waxy masses: fruit a pair of follicles. . . . . ASCLEPIADACEÆ, 49
Pollen powdery.
Ovaries 2: fruit a pair of follicles. . . . APOCYNACEÆ, 48

Ovary 4-lobed, forming 4 separate or separable seed-like nutlets. . . . . Borraginaceæ, 53
Ovary single and entire.
Style 3-cleft at apex: capsule 3-celled: corolla convolute. . . . . Polemoniaceæ, 51
Styles or stigmas 2 or 1.
Ovules and seeds at most 4, large, with large embryo and little or no albumen: peduncles axillary. Convolvulaceæ, 54
Ovules few or numerous: embryo small, in albumen.
Leaves all opposite or whorled and entire: capsule 1-celled: corolla convolute. . . Gentianaceæ, 50
Leaves various, mainly alternate.
Styles 2 (or 1 and 2-cleft): capsule 1 to 2-celled. . . . . Hydrophyllaceæ, 52
Style 1: stigma usually 1: capsule or berry 2-celled, rarely more. . . . . Solanaceæ, 55
See also Limosella, in . . . Scrophulariaceæ, 56

+ + *Corolla irregular: stamens (with anthers) 4 and didynamous, or 2: style* 1.

Ovary and capsule 2-celled: seeds small, mostly indefinite. . . . . Scrophulariaceæ, 56
Ovary and capsule 1-celled, with many-seeded placentæ in the axis. . . . . Lentibulariaceæ, 58
Ovary 4-parted, in fruit as many seed-like nutlets. . . Labiatæ, 60
Ovary undivided: fruit splitting into 2 or 4 one-seeded nutlets. . . . . Verbenaceæ, 59

Division III. APETALÆ. Corolla (and sometimes calyx) wanting.

A. *Flowers not in aments.*

1. *Ovary and fruit superior,* 1-*celled and* 1-*ovuled, or carpels distinct if more than one.*

Stipules sheathing the stem at the nodes. . . . Polygonaceæ, 66
Stipules not sheathing the stem or none.
Shrubs or trees.
Leaves alternate: flowers perfect: fruit a tailed akene. Cercocarpus, in Rosaceæ, 26
Leaves alternate: flowers unisexual: fruit a utricle. Chenopodiaceæ, 65
Leaves opposite.
Fruit an akene: leaves small and narrow. Coleogyne, in Rosaceæ, 26
Fruit a simple samara: leaves pinnate. Fraxinus, in Oleaceæ, 47
Herbaceous, or sometimes woody at base.
Fruit a utricle: seed lenticular: embryo annular or spiral.
Flowers with scarious persistent sepals and bracts: no stipules. . . . . Amarantaceæ, 64

Bracts herbaceous or none: no stipules. . CHENOPODIACEÆ, 65
Stipules scarious. . . . . ILLECEBRACEÆ, 63
Fruit a more or less triangular akene: embryo curved.
Flowers perfect, on jointed pedicels, involucrate. POLYGONACEÆ, 66
Akene not triangular: embryo straight.
Flowers unisexual: filaments incurved in bud: leaves simple. . . . . URTICACEÆ, 73
Submerged: flowers axillary, naked: leaves sessile, filiformly dissected. . . . . CERATOPHYLLACEÆ, 72
Carpels several and distinct, 1 to several-ovuled: calyx usually corolla-like. . . . . RANUNCULACEÆ, 1

2. *As in* (1), *but ovary and fruit enclosed by the calyx and apparently inferior.*

Shrubs, with scurfy opposite entire leaves: flowers diœcious: fruit baccate. . . . . ELÆAGNACEÆ, 67
Herbs: calyx corolla-like: fruit an akene.
Leaves simple, opposite, entire, without stipules: flowers involucrate. . . . . NYCTAGINACEÆ, 62
Leaves compound, alternate, stipulate. . . . . ROSACEÆ, 26

3. *Ovary and fruit superior, of* 2 *or more carpels.*

Fruit 2 to 4-celled, usually lobed: cells 1 to 2-ovuled.
Capsule 3-celled, 3-lobed: juice milky: mostly herbaceous. EUPHORBIACEÆ, 70
Fruit 4-celled, 4-lobed, compressed, indehiscent: styles 2: small aquatic, with opposite entire leaves. CALLITRICHACEÆ, 71
Fruit fleshy, 3-celled, 3-lobed: shrubs with alternate simple leaves. . . . . RHAMNACEÆ, 21
Fruit a double samara: trees with opposite pinnate leaves. SAPINDACEÆ, 23
Cruciferous herb: pod small, obcompressed. Lepidium, in CRUCIFERÆ, 6
Fruit capsular, 1-celled or more, several-ovuled: low herbs with opposite leaves.
Capsule 3 to 5-celled: succulent. . . . . FICOIDEÆ, 35
Capsule 1-celled: placentæ central.
Style and stigma 1: stamens alternate with the sepals. Glaux, in PRIMULACEÆ, 46
Styles or stigmas 3 or more: stamens opposite the sepals. . . . . CARYOPHYLLACEÆ, 11

4. *Ovary and fruit inferior.*

Fruit many-seeded: capsule (½ inferior) 1-celled: leaves cordate. . . . . SAXIFRAGACEÆ, 27
Fruit mostly 1-seeded.
Flowers perfect: fruit nut-like: herbs with alternate entire leaves. . . . . SANTALACEÆ, 69
Diœcious parasites on trees, with opposite leaves and jointed stems: berry with glutinous pulp. . . . LORANTHACEÆ, 68
Aquatic herbs, with opposite or verticillate leaves. . HALORAGEÆ, 29

B. *Flowers unisexual, at least the staminate in aments. Trees or shrubs with alternate leaves.*

Monœcious: male flowers in aments; female solitary or few: ovary inferior: leaves simple, with caducous stipules.
Anthers 2-celled: nut in a cup-like or spiny involucre. CUPULIFERÆ, 74
Anther cells separate: nut in a foliaceous or tubular involucre. . . . . Corylus in CUPULIFERÆ, 74
Monœcious or diœcious, flowers all in aments: ovary superior.
Fruit a 1-seeded nutlet: bracts thickened and rigid in fruit: nut winged or angled. . . . Betuleæ, in CUPULIFERÆ, 74
Fruit a many-seeded capsule: diœcious: bracts herbaceous: seeds comose. . . . . SALICACEÆ, 75

SUBCLASS II. MONOCOTYLEDONS. Embryo with a single cotyledon. Leaves mostly parallel-veined. Flowers usually 3-merous, never in fives. Mostly herbaceous.

A. *Ovary inferior: perianth conspicuous, colored: terrestrial: flowers perfect.*

Flowers irregular: stamens and style coherent; anthers 1 or 2: leaves alternate, sheathing . . . . . ORCHIDACEÆ, 76
Flowers regular: stamens 3, perigynous: leaves equitant. . IRIDACEÆ, 77
Flowers regular: stamens 6, perigynous: leaves not equitant. AMARYLLIDACEÆ, 78

B. *Ovary superior or nearly so: perianth regular or none.*

Carpels united into a compound ovary: perianth corolla-like, rarely partly herbaceous: terrestrial plants.
Woody climber, with tendrils: anthers 1-celled. . . SMILACEÆ, 80
Herbs: anthers 2-celled.
Perianth mostly of similarly colored lobes or divisions: stems from a bulb, corm, or rhizome. . . . LILIACEÆ, 79
Perianth of 3 green sepals, and 3 ephemeral deliquescent petals: stems from fibrous roots. . . COMMELINACEÆ, 81
Carpels distinct or solitary: aquatic or marsh herbs.
Perianth none: seed albuminous: fruit utricular or nut-like.
Flowers monœcious in heads or on a crowded spadix: leaves linear. . . . . TYPHACEÆ, 83
Small floating disk-like plants. . . . . LEMNACEÆ, 84
Perianth herbaceous, petaloid, or none: albumen none.
Carpels few: perianth none or in fertile flowers herbaceous. NAIADACEÆ, 86
Carpels numerous in a whorl or head: 3 sepals herbaceous, 3 petaloid. . . . . ALISMACEÆ, 85
Perianth of 6 similar glumaceous segments: capsule 3-valved. Rushes or sedge-like. . . . . JUNCACEÆ, 82
Flowers in the axils of scales or glumes, spicate, without evident perianth. Stems solid: sheaths closed: scales single: anthers basifixed. . . . . CYPERACEÆ, 87
Culms hollow, terete: sheaths split: glumes in pairs: anthers versatile. . . . . GRAMINEÆ, 88

CLASS II. GYMNOSPERMÆ. Ovules naked upon a scale or bract, or within open integuments. Monœcious or dicœcious trees or shrubs.

Male flowers in aments: female subsolitary, the ovule within a double integument with small terminal orifice: nearly naked dicœcious shrubs. . . . . GNETACEÆ, 89

Female flowers in aments, becoming dry cones or berry-like: ovules naked at the base of a scale: from shrubs to trees of the largest size; with needle or scale-like leaves. . . CONIFERÆ, 90

SERIES II. PTERIDOPHYTA, or the FERN GROUP. Plants without true flowers or seeds, but reproducing by spores; and with a distinct axis containing fibro-vascular bundles.

Stems solid, leafy: sporangia in the axils of simple leaves or bracts.

Leaves long and grass-like from a corm-like trunk: spores of two kinds . . . . . ISOETÆ, 91

Small leaves imbricated upon a moss-like stem: sporangia in terminal spikes.

Spores of two kinds: leaves with ligules. . . SELAGINELLÆ, 92

Spores of one kind: leaves without ligules. . LYCOPODIACEÆ, 93

Stems solid, subterranean, bearing long-petioled often compounded leaves (fronds).

Aquatics: leaves circinately developed: sporangia in fruits borne on the stem or petioles. . . . . RHIZOCARPEÆ, 94

Terrestrial: leaves erect in vernation: sporangia in special spikes or panicles. . . . . OPHIOGLOSSACEÆ, 95

Terrestrial: leaves circinate in vernation: sporangia on the under surface or margins of the leaves. . . . FILICES, 96

Stems hollow, jointed, and striate: leaves reduced to a toothed sheath at the joints: sporangia in a terminal spike or cone. . . . . EQUISETACEÆ, 97

BOTANY

OF THE

ROCKY MOUNTAINS.

SERIES I.

PHÆNOGAMIA OR FLOWERING PLANTS.

PLANTS bearing true flowers, that is, having stamens and pistils and producing seeds which contain an embryo.

CLASS I. ANGIOSPERMÆ.

Pistil consisting of a closed ovary which contains the ovules and forms the fruit.

SUBCLASS I. DICOTYLEDONS.

Embryo with a pair of opposite cotyledons. Leaves netted-veined. Flowers usually 4- or 5-merous.

DIVISION I. POLYPETALÆ.

Perianth consisting usually of both calyx and corolla; the petals not united with each other, sometimes wanting.

Order 1. **RANUNCULACEÆ.** (Crowfoot Family.)

Herbaceous or somewhat shrubby plants with very diverse characters; generally distinguished by the few or numerous sepals, petals, stamens, and pistils being distinct and free. The flowers are regular or irregular. The sepals are very commonly petal-like, and the petals are often wanting. The fruits are akenes, dry pods, or berries. The leaves vary from simple to much compounded, usually on the palmately veined type, with petioles dilated at base, and without stipules.

Tribe I. Sepals valvate, petal-like. Petals none or very small. The fruit a head of akenes, tailed with feathery or hairy or rarely naked styles. Leaves opposite.

1. **Clematis.** Half-woody, climbing by the petioles, or erect and herbaceous.

Tribe II. Sepals imbricate, often petal-like. The fruit a head or spike of akenes.

* Petals none. Akenes in a head.

2. **Anemone.** Sepals indefinite in number. Leaves on the stem opposite or whorled on or below one-flowered peduncles.
3. **Thalictrum.** Flowers mostly diœcious, panicled. Leaves alternate.

* * Petals slender. Akenes numerous in a long slender spike.

4. **Myosurus.** Flowers solitary on a scape. Sepals spurred at base.

* * * Petals generally broad and conspicuous. Akenes numerous in a head.

5. **Ranunculus.** Petals with a little pit or scale at the base inside. The akene differs from all others of the order in having the ovule erect.

Tribe III. Sepals imbricate. Petals none, small, or irregular. Fruit a pod or berry. Leaves alternate.

* Fruit consisting of pods (follicles), 1 to 15 in number.

+ Flowers regular. Pods 5 to 15.

6. **Caltha.** Sepals petal-like. Petals none. Pods 5 to 12. Leaves simple.
7. **Trollius.** Petals many, minute and stamen-like, hollowed near the base. Pods 8 to 15. Leaves palmately divided.
8. **Aquilegia.** Sepals deciduous. Petals 5, all spurred backward. Pods 5. Leaves ternately compound.

+ + Flowers irregular. Pods 1 to 5.

9. **Delphinium.** Upper sepal produced backward into a spur.
10. **Aconitum.** Upper sepal arched into a hood.

* * Fruit a berry of one carpel.

11. **Actæa.** Sepals caducous. Petals small. Leaves ternately compound. The flowers are in a single raceme.

1. CLEMATIS, L. Virgin's-Bower.

Sepals 4 or rarely more. A genus which is readily recognized by its few petal-like valvate sepals, and long-tailed akenes.

* *Petals none.*

+ *Stem erect.*

1. **C. Fremontii,** Watson. Stems *stout, clustered,* 6 to 12 inches high, leafy and usually branched, more or less villous-tomentose, especially at the nodes: *leaves simple,* 3 to 4 pairs, *thickish* and with the veinlets conspicuously

reticulated, *broadly ovate, entire or few-toothed:* flowers terminal, nodding; the thick purple sepals an inch long, *tomentose upon the margin, recurved at the tip:* akenes silky; the tails *less than an inch long,* naked above, silky at base. — Proc. Am. Acad. x. 339. This species was discovered by Fremont, but with locality unknown. It has been rediscovered in Kansas by Dr. Louis Watson and others, and is the western representative of *C. ochroleuca.*

2. **C. Douglasii,** Hook. Stem simple or branching, more or less villous, woolly at the joints: *leaves* from *pinnate to 2 or 3-pinnatifid; the leaflets linear or linear-lanceolate:* sepals thick, deep purple within, paler externally, *woolly at the apex, and spreading:* akenes silky; the tails *an inch or more in length.* — From Colorado to Washington Territory.

Var. **Scottii.** A form with leaflets ovate or lanceolate, and tips of sepals more reflexed and probably less woolly. — *C. Scottii,* Porter, Fl. Col. 1. Colorado and northward.

\+ \+ *Stem climbing, more or less woody.*

3. **C. ligusticifolia,** Nutt. Nearly glabrous: stems sometimes very long: leaves pinnate and ternate, mostly 5-foliolate; the leaflets oblong, acute, mostly somewhat lanceolate-cuneate, incisely toothed and trifid: flowers white, in paniculate corymbs, dicœcious: sepals thin, equalling the stamens. — Torr. & Gray, Fl. i. 9. From New Mexico to the Saskatchewan and Oregon, and also in California. Climbing over bushes and producing a great abundance of white flowers.

* * *Some of the outer filaments enlarging to small petals: stems woody.*

4. **C. alpina,** Mill., var. **occidentalis,** Gray. *Trailing,* nearly glabrous: *leaves biternately divided;* segments ovate or oblong-lanceolate, acuminate, frequently 3-lobed, irregularly toothed: sepals purplish-blue, thin: anther-bearing petals linear: akenes glabrous. — Powell's Geol. Black Hills, p. 531. The *C. alpina,* var. *Ochotensis,* of the various Western reports. From New Mexico to the Wahsatch and Teton Mountains.

5. **C. verticillaris,** DC. *Climbing: leaves trifoliolate,* with leaflets about as in the last, but oftener entire: the flowers 2 to 3 inches across, with the thin bluish-purple sepals widely spreading. — From California to Maine, and from the Wahsatch and Uinta Mountains to British America.

2. ANEMONE, L. Wind-flower.

Sepals colored and petal-like. Style short and stigma lateral. Akenes compressed, pointed or ending in long feathery awns. — Perennial herbs with radical leaves.

* *Akenes with long bearded tails.*

1. **A. patens,** L., var. **Nuttalliana,** Gray. Villous with long silky hairs: flower erect, developed before the leaves; which are ternately divided, the lateral divisions 2-parted, the middle one stalked and 3-parted, the segments deeply once or twice cleft into narrowly linear and acute lobes: sepals 5 to 7, purplish or whitish. — From the mountains eastward into Illinois and Wisconsin.

* * *Akenes without tails.*

+– *Akenes very numerous in a close head, densely villous.*

++ *Low (3 to 12 inches high) or slender plants, with simple stems.*

2. **A. decapetala,** L. Stem 3 to 6 inches high from a *round tuber:* root-leaves once or twice 3-parted or cleft: *involucre* (mostly sessile and far below the flower) 3-*parted,* the wedge-shaped divisions 3-cleft: *sepals* 10 *to* 20, *oblong-linear, purple or whitish: head of fruit oblong.* — *A. Caroliniana,* Walt. From Colorado to Arizona and New Mexico, and across the continent to the Carolinas.

3. **A. parviflora,** Michx. Stem 3 to 12 inches high from a *slender root-stock:* root-leaves 3-parted, their broadly wedge-shaped divisions crenate-incised or lobed: *involucre* 2 *to* 3-*leaved,* distant from the flower: *sepals* 5 *or* 6, *oval, white: head of fruit globular.* — Mountains of Colorado, and northward to the Arctic Sea.

++ ++ *Taller* (6 *inches to* 2 *feet*), *commonly branching above or producing two or more peduncles: sepals* 5 *to* 8, *silky or downy beneath, oval or oblong.*

4. **A. multifida,** Poir. Silky-hairy (6 to 12 inches high): principal involucre 2 to 3-leaved, bearing one naked and one or two 2-leaved peduncles; leaves of the secondary involucre *short-petioled,* similar to the root-leaves, *twice or thrice* 3-*parted and cleft, their divisions linear:* sepals *red,* sometimes greenish-yellow or whitish: *head of fruit spherical or oval.* — Across the continent in northern latitudes, and southward in the mountains through Colorado.

5. **A. cylindrica,** Gray. Taller, and clothed with silky hairs: flowers 2 to 6, on very long and upright naked peduncles: leaves of the involucre *long-petioled,* twice or thrice as many as the flower-stalks, 3-*divided, their divisions wedge-shaped,* the lateral 2-parted, the middle one 3-cleft, lobes cut and toothed at the apex: sepals *greenish-white: head of fruit cylindrical.* — From Colorado to Bitter Root valley and thence eastward across the continent.

+– +– *Akenes fewer, pubescent only.*

6. **A. dichotoma,** L. *Hairy,* rather low: *involucres sessile;* the primary ones 3-leaved, bearing a naked peduncle, and soon a pair of branches or peduncles with a 2-leaved involucre at the middle, which branch similarly in turn; their leaves broadly wedge-shaped, 3-cleft, cut and toothed: radical leaves 5 to 7-parted or cleft: sepals 5, obovate, white: *carpels orbicular.* — *A. Pennsylvanica,* L. Common on the foothills of Colorado, northward and eastward.

7. **A. nemorosa,** L. *Smooth* or somewhat villous: stem perfectly simple from a filiform rootstock, slender, leafless, except the *involucre of* 3 *long-petioled trifoliolate leaves;* their leaflets wedge-shaped or oblong, toothed or cut, or the lateral ones 2-parted; a similar radical leaf in sterile plants solitary from the rootstock: sepals 4 to 7, oval, white or pinkish: *carpels oblong, with a hooked beak.* — Northern United States and British America.

+– +– +– *Akenes glabrous.*

8. **A. narcissiflora,** L. Villous: leaves palmately 3 to 5-parted; segments cuneiform, incisely many-cleft, lobes linear: involucre somewhat similar, sessile, leaflets 3 to 5-cleft: pedicels several, umbelled, leafless,

1-flowered: flowers white: carpels roundish-oval. — Alpine. In Colorado at 13,000 feet altitude, and thence through British America.

3. THALICTRUM, L. Meadow-Rue.

Sepals 4 to 7, either greenish or petal-like. Pistils 4 to 15. — Perennial herbs with leaves 2 or 3 times ternately compound, the leaflets stalked. Flowers in corymbs or panicles. The diœcious species are easily recognized by combining that character with the much compounded leaves, and all of our species can be distinguished from *Anemone* by their alternate leaves and inconspicuous flowers.

* *Flowers perfect.*

1. **T. alpinum,** L. Stem simple, 2 *to* 8 *inches high,* slightly pubescent: *leaves mostly radical;* leaflets roundish, about ½ inch long, somewhat lobed, crenately toothed: *flowers nodding in a simple raceme: stigmas thick and pubescent: carpels ovate, sessile.* — Colorado and northward throughout British America.

2. **T. sparsiflorum,** Turcz. *Stem* 1 *to* 3 *feet high: upper leaves sessile: flowers on long pedicels in a loose panicle:* filaments clavate: carpels strongly compressed, *semi-obovate, short-stipitate,* thrice shorter than the persistent style. — Subalpine. Colorado and far northward; also in California.

* * *Flowers diœcious.*

3. **T. Cornuti,** L. *Stem* 2 *to* 4 *feet high: stem-leaves sessile* (without general petiole) or nearly so; leaflets roundish or oblong and more or less 3-lobed, *pale* and usually minutely pubescent *beneath,* the margin *mostly revolute and the veining conspicuous: panicles compound:* flowers white, greenish, and purplish: *filaments thickened upwards.* — Possibly includes *T. purpurascens,* L. Colorado, and in the Atlantic States.

4. **T. Fendleri,** Engelm. Rather *low and slender,* occasionally somewhat pubescent: *leaves petioled* or the uppermost sessile; leaflets usually small: *flowers in an open panicle: anthers setosely acuminate:* akenes slightly glandular-puberulent, *oblong to ovate, acuminate,* 2 *or* 3 *lines long.* — Pl. Fendl. 5. Colorado and New Mexico, and westward to Utah and Nevada.

5. **T. occidentale,** Gray. Like the last, but *stouter,* the *leaflets larger* and akenes few in a head (1 to 6), *narrowly oblong* (3 *or* 4 *lines long*), and *narrowed at each end.* — Proc. Am. Acad. viii. 372. From California to Washington Territory, and extending into Western Montana.

4. MYOSURUS, L. Mousetail.

Sepals 5. Petals 5, linear, on a slender claw with a pit at its summit. Stamens 5 to 20. — Very small annual herbs, with a tuft of linear or spatulate entire radical leaves, and solitary flowers on simple scapes. The long slender spike of akenes and linear radical leaves give the plant the appearance of a diminutive plantain.

1. **M. minimus,** L. Scapes 2 to 6 inches high: leaves usually shorter: akenes blunt, on slender spikes 1 or 2 inches long. — From California through Colorado to the Ohio Valley.

M. ARISTATUS, Benth., may be found where our boundary touches Utah and Southern Idaho. It is characterized by its akenes being beaked with a divergent persistent style nearly equalling the akene.

5. RANUNCULUS, L. CROWFOOT. BUTTERCUP.

Sepals usually 5. Petals 3 to 15. Akenes mostly flattened, pointed. — Mostly perennial herbs. Flowers either solitary or somewhat corymbed, usually yellow and often showy. The leaves are various, and those of the stem alternate.

§ 1. *Aquatic herbs with the submersed leaves, if any, finely divided: petals white, the claw yellow: akenes transversely wrinkled.*

1. **R. aquatilis,** L., var. **trichophyllus,** Chaix. Stems long and coarsely filiform: leaves all submersed and cut into numerous *soft capillary segments, which usually collapse when withdrawn from the water:* akenes in a close globular head. — Common throughout the continent in stagnant or slow-flowing waters.

Var. **stagnatilis,** DC. Leaves all under water, the divisions and subdivisions *short, spreading in one roundish plane, rigid, keeping their form without collapsing when withdrawn from the water.* — The *R. divaricatus* of Gray's Manual and the Western reports. Rarer than the former, but with the same range.

§ 2. *Terrestrial herbs, but often growing in wet places, mostly erect: sepals green, rarely yellow: petals yellow: akenes neither wrinkled nor hispid.*

* *All the leaves undivided, the margins entire.*

2. **R. Flammula,** L., var. **reptans,** Gray. Glabrous throughout: stems *filiform, creeping and rooting at the joints:* leaves mostly lanceolate and *acute at each end:* petals half longer than the sepals: akenes few in a small globular head, plump; beak very short and curved. — Found in Colorado, but most common northward, where it extends across the continent.

3. **R. alismæfolius,** Geyer. Glabrous throughout: stems nearly or quite *erect,* 6 to 16 inches high, *rather stout:* leaves broadly lanceolate, *blunt at apex:* petals conspicuously nerved, nearly twice as long as the sepals: akenes *slightly flattened,* pointed with a nearly or quite *straight beak,* crowded in a compact *ovate head.* — The form called var. *montanus,* Watson, is the typical form. Rocky Mountains and westward. The Eastern species bearing this name is *R. ambigens,* Watson.

4. **R. Macauleyi,** Gray. *Leaves lingulate, the truncate apex 3-toothed;* radical ones (early ones oblong) *tapering into a petiole;* cauline ones sessile: *sepals very dark villous outside:* petals golden: carpels tapering into a short subulate style: fruit unknown, though head of akenes probably oblong. — Proc. Am. Acad. xv. 45. Mountains in San Juan Co., Colorado. The flowers resemble those of *R. nivalis,* but the remarkable foliage readily distinguishes it from every other species.

** *Radical leaves undivided: stem leaves, if any, toothed or lobed: glabrous perennials,* 3 *to* 6 *inches high.*

5. **R. Cymbalaria,** Pursh. Flowering stems or scapes *leafless,* 1 to 7-flowered: leaves broadly ovate or ovate-cordate, *coarsely crenate, clustered at*

the root and at the joints of the long filiform rooting runners: petals longer than the sepals: the akenes striate-veined on the sides, enlarging upwards, with a short *oblique beak: head oblong.* — Across the continent in marshy ground.

6. **R. glaberrimus,** Hook. Stems 1 to 3-flowered: radical leaves broadly oval, either *entire or with 3 large blunt teeth at the apex;* stem-leaves cuneate at the base, *3-cleft to the middle:* sepals half as long as the petals: akenes plump, tipped with a short *curved beak: head globular.* — From Colorado to Wyoming and Washington Territory; also in California.

* * * *Some or all the leaves cleft or divided.*
+– *Primary root-leaves crenate or toothed.*

7. **R. rhomboideus,** Goldie. Dwarf (3 to 6 inches high), *hairy:* root-leaves *roundish or rhombic-ovate,* rarely subcordate; lowest stem-leaves similar or 3 to 5-lobed; the upper 3 to 5-parted, almost sessile, the lobes linear: *petals large, exceeding the calyx:* akenes orbicular *with a minute beak.* — S. W. Colorado to British America and eastward to Illinois and Michigan.

8. **R. abortivus,** L. *Glabrous,* 6 inches to 2 feet high: primary root-leaves *round heart-shaped or kidney-form,* barely crenate, the succeeding ones often 3-lobed or 3-parted; those of the stem and branches 3 to 5-parted or divided, their divisions oblong or narrowly wedge-form, mostly toothed: *petals shorter than the reflexed sepals: akenes with a minute curved beak.* — From the mountains eastward across the continent. Most variable as to foliage.

+– +– *Root-leaves lobed, cleft, or parted.*
++ *Style straight or wanting.*

9. **R. hyperboreus,** Rottb., var. **natans,** Regel. *Stem filiform, creeping:* leaves glabrous, petioled, *3-cleft;* the lobes oval-oblong, *divaricate,* the lateral ones somewhat 2-cleft: *heads of akenes globose, compact: style wanting.* — In swamps at middle elevations, Colorado and northward.

10. **R. nivalis,** L. *Stem about 1-flowered: radical leaves on long petioles,* dilated, lobed, the lobes somewhat ovate; cauline ones nearly sessile, palmate: *calyx very hirsute,* shorter than the obovate entire petals: *style as long as the glabrous ovaries.* — In the mountains of British America.

Var. **Eschscholtzii,** Watson. *Radical leaves 3-parted,* the divisions lobed, *ciliate: style shorter than the akenes.* — Colorado, Yellowstone Park, and northward in the mountains.

11. **R. sceleratus,** L. Glabrous: *stem thick and hollow,* a foot high: *root-leaves 3-lobed;* lower stem-leaves 3-parted, the lobes obtusely cut and toothed; the uppermost almost sessile, with the lobes oblong-linear and nearly entire: petals scarcely exceeding the sepals: *akenes barely mucronulate, very numerous, in oblong or cylindrical heads.* — From Colorado northward, and across the continent. In drying, the numerous akenes are soon deciduous from the receptacle.

++ ++ *Style curved.*
= *Stem usually 1-flowered.*

12. **R. pygmæus,** Wahl. Stem 1 to 2 inches high: leaves glabrous, 3 *to 5-cleft;* radical ones petioled: *sepals glabrous, longer than the somewhat reflexed petals: heads oblong: akenes subglobose, pointed with a short hooked style.* — Mountains of Colorado and far northward.

13. **R. adoneus,** Gray. Low, sparsely villous, becoming glabrous: stems branching from the base, 1 to 3-leaved above, sometimes sarmentose-decumbent and 2 to 3-flowered: leaves *twice pedately parted,* segments narrowly linear: petals golden-yellow, *twice exceeding the subvillous sepals:* akenes crowded in an *oval head, turgid, with the rather long ensiform beak scarious-winged on each edge.* — Proc. Acad. Philad. 1863, 56. High altitudes close to the snow, Colorado and northward.

= = *Stems bearing more than one flower.*

a. *Dwarf* (2 *to* 3 *inches high*).

14. **R. digitatus,** Hook. Very glabrous: leaves few, petioled, digitately lobed, the 3 to 5 segments narrowly lanceolate or oblong-spatulate, obtuse: flowers 2 or 3, terminal, with reflexed sepals and 7 to 11 oblong cuneate petals: akenes beaked with a subulate recurved style. — In the Wahsatch, N. Utah, and northward into British America.

b. *A foot or two high.*

15. **R. affinis,** R. Br. Radical leaves petioled, *usually pedately multifid;* cauline ones subsessile, digitate, with broadly linear lobes: akenes with recurved beaks *in oblong-cylindrical heads,* more or less pubescent. — Colorado and northward.

Var. **leiocarpus,** Trautv. *Lower leaves usually lobed or crenate: flowers small: carpels smooth* or somewhat pubescent. — Colorado.

Var. **cardiophyllus,** Gray. *Hirsutely pubescent: radical leaves round-cordate,* undivided or many-cleft; cauline ones palmately many-cleft: *flowers an inch in diameter.* — Same range as the species.

16. **R. Nelsoni,** Gray. Sparingly pilose: *the simple radical leaves often* 3 *to* 4 *inches in diameter, more or less deeply* 3*-lobed;* the uppermost rarely parted; the lower usually cordate in outline: *petals not more than* 3 *lines long,* exceeding the sepals: akenes pilose (sometimes glabrous), in a small head, rigid, more or less scattered, bearing a very much hooked style *of the same length.* — Proc. Am. Acad. viii. 374. About Yellowstone Lake and far northward.

+ + + *Leaves all ternately divided.*

17. **R. Pennsylvanicus,** L. Hirsute with rough spreading bristly hairs: stem stout, erect: divisions of the leaves stalked, somewhat ovate, unequally 3-cleft, sharply cut and toothed, acute: *petals pale, not exceeding the sepals: akenes not margined,* pointed with a sharp straight beak, *in oblong heads.* — Colorado and northward, and in the Atlantic States.

18. **R. repens,** L. *Low,* hairy or nearly glabrous: *stems ascending and some of them forming long runners:* divisions of the leaves all (or at least the terminal one) stalked, broadly wedge-shaped or ovate, unequally 3-cleft or parted and variously cut: petals obovate, *much larger than the spreading sepals: akenes strongly margined, pointed by a stout straightish beak, in globular heads.* — Across the continent.

19. **R. macranthus,** Scheele. Stem erect, *taller,* more or less hirsute with spreading hairs: leaves ternately or more frequently bi-ternately divided, segments usually stalked, laciniately lobed and toothed: *flowers large, with the sepals strictly reflexed: akenes crowded in subglobose heads, about equalling the*

broad subulate beaks. — *R. repens*, var. *macranthus*, Gray. In the Uinta Mountains, and from Oregon to Nevada and Texas. The largest of the genus sometimes reaching a height of 5 feet.

20. **R. Nuttallii,** Gray. *Smooth,* 6 to 8 inches high: radical leaves *bi-ternately divided*, segments 3 to 5-parted, lobes oblong or linear, sometimes 2 to 3-cleft: petals *spatulate, a little longer than the broader sepals which are also yellow:* akenes rather few, in a globose head, *cylindrical-oblong, grooved, many-nerved, tipped with a long, slender, incurved style.* — Colorado and Wyoming, along the eastern foothills.

21. **R. multifidus,** Pursh. *Stems floating or immersed, with the divisions of the leaves long and filiform; or rooting in the mud and the leaves round-reniform and more or less deeply lobed and toothed:* petioles short, *broadly stipulate-dilated at base:* flowers large, *the petals with conspicuous obovate scales:* akenes in a small globose head, *beaked by a short straight style.* — Colorado and northward, and across the continent.

+ + + + *Leaves pinnately divided.*

22. **R. orthorhynchus,** Hook. More or less villous, the stems often slender, 1 or 2 feet high: divisions of the leaves variously lobed and cut, the segments often narrow: sepals reflexed: petals bright yellow or purple-tinged outside: akenes large, flattened, in a close globose head, with a slender straight beak as long as the ovary. — In the Bitter-root Mountains, northward and westward.

6. CALTHA, L. Marsh Marigold.

Sepals 5 to 12, deciduous. Pods each with several seeds, and when ripening spreading and flattened. — Glabrous perennial herbs, easily recognized by their undivided leaves and showy petal-like sepals.

1. **C. leptosepala,** DC. Leaves round- to oblong-ovate (longer than broad), with a somewhat narrowed and quadrate base, usually very obscurely crenate above and rather coarsely and often acutely serrate below: flowers solitary, very rarely 2, the second flower subtended by a petioled leaf: sepals white or often tinged with blue. — From New Mexico to Alaska. An excellent pot-herb.

7. TROLLIUS, L. Globe-flower.

Sepals 5 to 15, petal-like. Pods sessile, many-seeded. — Smooth perennials, with large solitary terminal flowers and palmately parted and cut leaves.

1. **T. laxus,** Salisb. Flowers pale greenish-yellow or nearly white: petals much shorter than the stamens. — Associated with the preceding, but less common.

Var. **albiflorus,** Gray. Stem 6 to 12 inches high, and flowers white. — Near snow-banks. "The pure white and broader sepals, lower stature, and alpine station, distinguish this from the ordinary form," Colorado, *Parry.*

8. AQUILEGIA, L. Columbine.

Sepals 5, regular, colored like the petals. Petals all alike, with a short spreading lip. Pods erect, many-seeded. — Perennials, with the leaflets of the 2 to 3 ternately compound leaves lobed. Recognized by its large showy flowers and prominent spurs.

* *Caulescent: spur longer or shorter than the calyx.*

+ *Spur straight.*

++ *Flowers red and yellow.*

1. **A. Canadensis,** L. *Spurs much longer than the sepals:* flowers 2 inches long, scarlet, yellow inside (or rarely all over), nodding so that the spurs turn upwards: limb or lip of the petals distinct: stamens and styles longer than the ovate sepals. — Along subalpine rivulets and eastward across the continent.

2. **A. formosa,** Fisch. Like the preceding or stouter: *spurs shorter, not longer than the elongated sepals.* — Colorado and northward, thence westward into Oregon.

++ ++ *Flowers never red.*

3. **A. cœrulea,** James. Stem 1 to 3 feet high, *glabrous:* leaves mostly radical, glaucous beneath, the leaflets deeply cleft: flowers 2 to 2½ inches in diameter, *pale blue,* sometimes ochroleucous, pinkish, or white: spur very slender: *sepals rhomboid-ovate,* longer than the limb of the petals. — On shaded slopes throughout the Rocky Mountains. A very beautiful and showy plant.

4. **A. chrysantha,** Gray. Usually taller and more slender: *peduncles often pubescent: flowers bright yellow throughout:* spurs even more slender: *sepals lanceolate-oblong,* longer but not broader than the limb of the petals. — Proc. Am. Acad. viii. 621. Colorado and southward.

+ + *Spur hooked at the tip.*

5. **A. flavescens,** Watson. *Plant 2 to 3 feet high,* glabrous except the *pubescent peduncles and carpels: flowers yellow,* the sepals frequently tinged with scarlet: spurs shorter than the spreading or reflexed oval or oblong-ovate sepals: limb large and dilated: *stamens long exserted.* — Bot. King's Rep. 10. Wyoming, Montana, and Idaho.

6. **A. brevistyla,** Hook. *Stems 6 to 8 inches high,* spreading: leaves bi-ternate; leaflets 3-lobed, crenate: *flowers small, blue,* about 6 lines long, including the spur: sepals oblong-ovate: *petals a little exceeding the stamens.* — *A. vulgaris,* var. *brevistyla,* Gray. Colorado and northward into British America.

* * *Acaulescent: spur shorter than the calyx: flowers blue.*

7. **A. Jonesii,** Parry. Minutely soft-pubescent: scape 1 to 3 inches high, naked, 1-flowered: leaves all crowded and the persistent scale-like dilated bases of their petioles imbricated on the stout ascending branches of the rootstock; the partial petioles short or wanting, so that the 9 small obovate entire leaflets are in a dense cluster: pods reticulated, smooth. — Am. Nat. viii. 211. Summit of Phlox Mountain, Wyoming, *Parry.*

9. DELPHINIUM, L. Larkspur.

Sepals 5, petal-like. Petals 2 or 4, irregular; when 4, the upper 2 developed backwards into a spur which is enclosed in the spur of the calyx. Pods many-seeded. — Erect herbs usually with palmately lobed, cleft, or dissected leaves, and racemose flowers, which are blue shading to white.

* *Not glandular-pubescent.*

1. **D. azureum,** Michx. *Stem slender,* branching, *often slightly pubescent:* leaves deeply 3 to 5-parted, *the divisions 2 to 3 times cleft, the lobes all narrowly linear: flowers sky-blue or whitish, in a strict not dense raceme:* spur ascending, usually curved upwards. — Colorado, Wyoming, and eastward across the plains.

2. **D. Menziesii,** DC. *Glabrous below,* at least at the very base, *pubescent above with spreading hairs,* especially the inflorescence: leaves 5-parted, *divisions 2 to 3-cleft: flowers large, deep-blue, in a loosely few- to many-flowered simple raceme: upper petals veined with purple:* spur long and slender: *ovaries somewhat tomentose.* — Wyoming, Montana, and northwestward.

3. **D. bicolor,** Nutt. Very similar, but the *whole plant glabrous throughout, including the ovaries,* or occasionally somewhat tomentose-pubescent; and the *flowers* are uniformly *smaller.* — The *D. Menziesii* of Fl. Colorado and *D. Menziesii,* var. *Utahense,* of Bot. King's Rep. 12. Foothills of Colorado and northward. Closely resembles the eastern *D. tricorne.*

× 4. **D. scopulorum,** Gray. *Pubescent with a fine hoary tomentum* or glabrous: *stem leafy:* leaves orbicular in outline, 3 to 5-parted, *the divisions deeply 2 to 3-cleft, the segments many-lobed or laciniate:* flowers sparingly pilose without, in a many-flowered strict raceme: spur longer than the sepals: *pods pubescent,* on stout pedicels. — Pl. Wright. ii. 9. Rocky Mountains from New Mexico to British America.

* * *Glandular pubescent.*

5. **D. occidentale,** Watson. Known by the stiff glandular spreading pubescence, which extends rarely to the ovaries and fruit: flowers numerous, dull or dark blue, very variable in size, often in compound racemes: seeds light colored and somewhat spongy. — *D. elatum,* var.(?) *occidentale,* Watson. Alpine or subalpine, from Colorado to Oregon.

10. ACONITUM, L. Aconite. Monkshood. Wolfsbane.

Sepals 5, petal-like. Petals 2 to 5; the upper 2 with long claws and irregular spur-like blades concealed within the hood; the lower 3 very minute or obsolete. Pods many-seeded. — Herbs with palmately lobed leaves.

1. **A. Columbianum,** Nutt. Stem stout, 3 to 6 feet high: more or less pubescent above with short spreading yellowish viscid hairs: divisions of the leaves broadly cuneate and laciniately toothed or lobed: flowers purple or white in a loose terminal raceme: the hood varying much in breadth and in length of beak. — Torr. & Gray, Fl. i. 34. *A. nasutum,* Hook. *A. Fischeri* of Bot. Calif. i. 12. Colorado, Wyoming, and westward to the Sierra Nevada.

11. ACTÆA, L. Baneberry.

Sepals 4 to 6, petal-like. Petals 4 to 10. Stigma sessile, 2-lobed. Berry with many seeds, which are packed horizontally in 2 rows. — Perennial herbs with 2 to 3 ternately compound leaves.

1. **A. spicata,** L., var. **arguta,** Torr. Smooth, 1 to 2 feet high: leaflets larger and more serrated than in the next: *petals oblong,* obtuse: berries

either white or red, in a loose, rather *elongated raceme.* — From the mountains westward.

Var. **rubra,** Ait. *Raceme ovate: petals rhombic-spatulate,* much shorter than the stamens: berries cherry-red. — From the mountains eastward to the Atlantic.

Order 2. **BERBERIDACEÆ.** (Barberry Family.)

Our species are shrubs with alternate simple or compound leaves and no stipules; the flower parts are distinct and free, and are opposite to each other instead of alternate; the anthers open by uplifted valves. — Sepals and petals imbricated and deciduous. Pistil one, simple; style short or none.

1. BERBERIS, L. Barberry.

Sepals 6, colored like the petals, with 3 or 6 closely appressed bractlets. Petals 6, yellow. Stamens 6. Stigma circular and peltate. Fruit a berry with 1 to 3 seeds. — Shrubs with yellow wood and the flowers in clustered bracteate racemes.

1. **B. repens,** Lindl. *A low shrub less than a foot high:* leaflets 3 to 7, ovate, acute: *racemes few, terminating the stems.* — Throughout the Rocky Mountains. This is the *B. Aquifolium* of Fl. Colorado and the various Western Reports. *B. Aquifolium* ranges farther west, especially in Oregon and Washington Territory, and is a much larger shrub, with clusters of racemes.

2. **B. Fendleri,** Gray. *Much taller* (3 to 6 feet), *with branches smooth and shining as if varnished:* leaves entire or irregularly spinulose-serrate: *racemes pendulous, densely-flowered:* calyx with conspicuous red bracts. — Pl. Fendl. 5. S. W. Colorado, southward, and westward to S. California.

Order 3. **NYMPHÆACEÆ.** (Water-Lily Family.)

Aquatic herbs, with horizontal trunk-like rootstocks or sometimes tubers; the leaves (in ours) deeply cordate; flowers with all the parts distinct and free, solitary and axillary on long peduncles; stamens numerous.

1. NUPHAR, Smith. Yellow Pond-Lily. Spatter-Dock.

Sepals 5 to 12, persistent, usually yellow within and partly green without. Petals and stamens short and numerous, densely crowded around the ovary. Ovary 8 to 20-celled, crowned by a radiate stigma, the cells many-seeded. — In shallow water, sending up large leathery leaves which are usually upright, but sometimes floating.

1. **N. advena,** Ait. Emersed and erect leaves thick, varying from *roundish to ovate* or almost oblong in outline, *the sinus open, or closed, or narrow: sepals* 6: *petals like the stamens,* thick and fleshy, truncate: *fruit ovoid.* — Abundant in the Yellowstone Park, and extending northward and eastward across the continent.

2. **N. polysepalum,** Engelm. Larger: leaves 6 to 12 inches long, *rounded above, deeply cordate at base: sepals* 8 *to* 12: *petals dilated and unlike the stamens,* often tinged with red: *fruit globular.* — Mountain lakes in Colorado, westward and northward.

Order 4. PAPAVERACEÆ. (Poppy Family.)

Herbs, usually with milky or orange-yellow juice; sepals 2 or 3, caducous; petals twice as many, in two sets; stamens indefinite; ovary 1-celled, with parietal placentæ; seeds numerous. — Leaves alternate, without stipules. Petals imbricated and commonly crumpled in the bud.

1. **Papaver.** Ovary incompletely several-celled by the projecting placentæ. Stigmas united into a radiate crown. Pod opening by chinks or pores under the edge of the stigma.
2. **Argemone.** Ovary strictly 1-celled. Pod opening by valves, and with the leaves prickly.

1. PAPAVER, L. Poppy.

Sepals 2. Stigma 4 to 20-rayed. Pod short and turgid. — Herbs with a white juice, and nodding flower-buds.

1. **P. nudicaule,** L. Scape 1-flowered, 2 to 3 inches high, naked, hispid as well as the calyx with brownish hairs: leaves lance-ovate in outline, deeply pinnatifid: petals lemon-yellow: pod obovate, hispid. — *P. alpinum* of the Fl. Colorado. Alpine. Colorado and in Arctic America.

2. ARGEMONE, L. Prickly Poppy.

Sepals 2 or 3, often prickly. Stigma 3 to 6-rayed. Pod oblong; seeds crested. — Well marked by the prickly bristles and yellow juice. Leaves sessile, sinuate-lobed, with prickly teeth. Flower-buds erect.

1. **A. platyceras,** Link & Otto. Erect, 1 to 2½ feet high, hispid throughout or armed with rigid bristles or prickles: lower leaves attenuate to a winged petiole; the upper sessile or auriculate-clasping: flowers white: pod oblong. — *A. hispida,* Gray. Colorado to Mexico and westward.

It is doubtful whether *A. Mexicana* occurs in Colorado, but it ranges farther south.

Order 5. FUMARIACEÆ. (Fumitory Family.)

Tender herbs, with watery juice, dissected compound leaves, perfect irregular hypogynous flowers with parts in twos, except the diadelphous stamens which are 6, ovary 1-celled, seeds, etc. as in *Papaveraceæ,* to which order Bentham & Hooker have united it.

1. **Dicentra.** Corolla heart-shaped (in ours) at the base.
2. **Corydalis.** Corolla 1-spurred at the base.

1. DICENTRA, Borkh.

Sepals 2, small and scale-like. Petals 4, in two sets; the outer pair larger, saccate at base, the tips spreading; the inner much narrower, spoon-shaped, the hollowed tips lightly united at the apex, thus forming a cavity which contains the anthers and stigma. Middle anther in each set 2-celled, lateral ones 1-celled. Stigma 2-lobed. Pod 1-celled. — Glabrous perennials with the fleshy root surmounted by a bulb-like cluster of fleshy grains and ternately or pinnately compound leaves.

1. **D. uniflora,** Kellogg. The 3 to 7 divisions of the leaves pinnatifid into a few linear-oblong or spatulate lobes: scape 2 to 3 bracted, 1-flowered: flowers flesh-colored, ½ inch long, the divergent or reflexed tips of the outer petals equalling or exceeding the erect gibbous-saccate base; inner ones not crested, the blade broadly hastate: pod abruptly beaked with the short style. — Alpine. Wahsatch and Teton Mountains, and westward in the Sierra Nevada.

2. CORYDALIS, DC.

Corolla one-spurred at the base on the upper side. Otherwise as in *Dicentra.*

* *Corolla golden-yellow; spur shorter than the rest of the flower.*

1. **C. aurea,** Willd. Stems low or decumbent: racemes simple: the slightly decurved spur *not half the length of the rest of the flower:* tips of the outer petals blunt, crestless and naked on the back: *pods usually pendent: seeds smooth and even, turgid, marginless,* partly covered by the scale-shaped aril. — From Colorado northward and eastward.

Var. **occidentalis,** Gray. *Spur longer: pods erect:* seeds lenticular *with acute margins.* — More common in our range than the type. Colorado to Montana, and eastward to Missouri and Texas.

Var. **micrantha,** Engelm. Flowers small, *nearly spurless, on short pedicels: pods ascending.* — From the Western Mississippi States to the Uinta Mountains.

2. **C. curvisiliqua,** Engelm. Differs from the last in having longer 4-*angular pods ascending on very short pedicels: the acute-margined seeds muricate.* — *C. aurea,* var. *curvisiliqua,* Gray. Common in the mountains of Colorado and southeastward.

* * *Corolla white or cream-color; spur longer than the rest of the flower.*

3. **C. Brandegei,** Watson. Tall and stout (5 feet high): leaves twice or thrice pinnately divided; the *lanceolate leaflets* ½ to 1 inch long, acute or acuminate: hood not crested, the margins folded back and *not projecting beyond the obtuse summit:* pod oblong-obovate, *obtuse,* reflexed. — Mountains of S. Colorado and in the Wahsatch. Formerly referred to *C. Caseana,* which has a more westerly range.

4. **C. Cusickii,** Watson. Leaves bipinnately divided; the *oblong-oval leaflets acute at each end,* half-inch long: the broad margins of the hood *produced beyond its acute apex and folded back over the narrow and somewhat crisped or erose crest: pod acute.* — Extending from Oregon into the Bitter Root Mountains.

Order 6. **CRUCIFERÆ.** (Mustard Family.)

Herbs, with a pungent watery juice, cruciform corolla, tetradynamous stamens, and a 2-celled pod with 2 parietal placentæ. — Sepals 4, deciduous. Petals 4. Ovary 2-celled by a partition which stretches across from the placentæ, rarely 1-celled. Style undivided or none; stigma entire or 2-lobed. Fruit a silique or silicle, the two valves falling away from the partition, which persists and is called the *replum*, in a few genera indehiscent. Ovules few or numerous. Flowers generally in racemes and without bractlets. Leaves alternate, without stipules. The mature pods are necessary for analysis.

I. Pod dehiscent, 2-valved.

* Pod strongly compressed parallel with the broad partition: cotyledons accumbent (i. e. the radicle and cotyledons appearing in cross-section thus o8).

← Pod short; valves nerveless or faintly 1-nerved: flowers white or yellow.

1. **Draba.** Pod ovate to oblong or linear, few to many-seeded; valves flat or convex. Seeds wingless. Low, flowers racemose.

← ← Pod elongated.

↔ Valves nerveless; replum thickened; seeds wingless: flowers white: leaves all petioled.

2. **Cardamine.** Pod moderately beaked or pointed. Stems leafy, with elongated racemes.

↔ ↔ Valves 1-nerved; replum thin; seeds flat, often winged or margined: flowers white to purple (sometimes yellowish in *Streptanthus*): cauline leaves (if any) sessile.

3. **Parrya.** Anthers linear. Petals broadly obovate. Seeds in one or two rows. Scape naked.

4. **Arabis.** Anthers short, scarcely emarginate at base. Petals with a flat blade and claw. Calyx short or narrow, rarely colored. Seeds in 1 or 2 rows.

5. **Streptanthus.** Anthers elongated, sagittate at base. Petals often without a dilated blade, more or less twisted or undulate, the claw channelled. Calyx dilated and usually colored. Seeds in one row.

* * Pod terete or 4-angled, slightly or not at all compressed; seeds not margined.

← Pod long-linear (1 to 4 inches); valves 1-nerved; seeds in 1 row, oblong, somewhat flattened, cotyledons incumbent (i. e. the radicle and cotyledons appearing in cross-section thus oO). Stout biennials or perennials.

↔ Flowers greenish-yellow to purple: anthers sagittate.

6. **Caulanthus.** Petals with a broad claw, somewhat dilated above and undulate, little longer than the broad sepals, greenish-yellow or purple. Filaments included. Stigma nearly sessile, somewhat 2-lobed. Pod sessile, 3 inches long or more.

7. **Thelypodium.** Petals with narrow claw and flat linear to rounded limb, much exceeding the narrow sepals, usually pink to purple. Filaments often exserted. Style short; stigma mostly entire. Pod sessile or short-stipitate.

↔ ↔ Flowers yellow.

8. **Stanleya.** Pod somowhat terete, long-stipitate. Stigma sessile, entire. Anthers not sagittate, spirally coiled. Leaves entire or pinnatifid.

9. **Erysimum.** Pod 4-angled, sessile. Stigma 2-lobed. Anthers sagittate, not coiled. Leaves narrow, entire or repandly toothed.

← ← Pod linear, mostly less than 1 inch long; valves 1 to 3-nerved; seeds in 1 or 2 rows, globose to oblong: flowers usually yellow (white or pinkish in *Smelowskia*): at least the lower leaves pinnatifid.[1]

[1] *Brassica*, an introduced genus, may be looked for in this group, differing from the other genera in its nearly terete pod with a long stout beak, globose seeds with the cotyledons infolding the radicle, and long sagittate anthers. See foot-note, p. 23

10. **Barbarea.** Pod somewhat 4-angled, pointed. Seeds oblong; cotyledons nearly accumbent. Anthers short, oblong. Leaves lyrately-pinnatifid. A smooth marsh perennial.

11. **Sisymbrium.** Pod nearly terete, short-pointed or obtuse. Seeds oblong; cotyledons incumbent. Anthers linear-oblong, sagittate. Mostly annual, with finely dissected or entire leaves.

12. **Smelowskia.** Pod short, 4-angled, pointed at each end. Alpine perennials with narrowly pinnatifid leaves; otherwise as *Sisymbrium*.

+– +– +– Pod oblong-cylindric to globose; valves strongly convex, nerveless; seeds in 2 rows, cotyledons accumbent.[1]

13. **Nasturtium.** Pod oblong or short-linear. Flowers white or yellow. Smooth or somewhat hispid.

14. **Vesicaria.** Pod ovate to globose. Seed flattened. Flowers yellow. Densely stellate-canescent.

* * * Pod more or less flattened contrary to the partition, which is narrower than the valves; seeds not winged.

+– Valves 1-nerved or obtusely carinate, not winged; cells several-seeded; cotyledons incumbent: flowers white.

15. **Subularia.** Pod ovoid, slightly compressed. A dwarf stemless aquatic, smooth, with tufted subulate leaves.

16. **Capsella.** Pod obcordate or oblong, much compressed. Nearly smooth annuals.

+– +– Valves acutely carinate or winged; cells few (1 to 5)-seeded; cotyledons accumbent (mostly incumbent in *Lepidium*): flowers white.

17. **Thlaspi.** Pod cuneate-oblong; valves sharply carinate; cells 2 to 4-seeded. A smooth alpine perennial with entire leaves.

18. **Lepidium.** Pod orbicular or obovate, 2-winged at the summit; cells 1 to 2-seeded.

+– +– +– Valves inflated, nerveless; cells several-seeded; cotyledons accumbent: flowers yellow.

19. **Physaria.** Pod didymous; cells nearly globular. Stellate-canescent perennials with entire leaves.

II. Pod of 2 indehiscent cells, separating at maturity from the persistent axis.[2]

20. **Biscutella.** Cells flat, nearly orbicular, 1-seeded. Flowers rather large. Stigma dilated or conical, nearly sessile.

1. DRABA, L. Whitlow-Grass.

Sepals equal. Filaments mostly flattened, without teeth: anthers rounded or oval. — Leaves entire or toothed.

* *Stems scape-like, leafless (or perhaps 1 or 2-leaved).*

1. **D. stellata,** Jacq. Scape with a single leaf, *pubescent: leaves oblong-oval, tomentose with a short stellate pubescence: flowers white: pedicels puberulent: pods oblong.* — Uinta and Teton Mountains, and far northward.

Var. **nivalis,** Regel. *Scape naked or sometimes with one or two leaves, pubescent: leaves oblanceolate to obovate,* canescent with a stellate pubescence: *pods narrowly oblong, and, with the pedicels, becoming glabrous.* — *D. nemorosa,* var. *alpina,* of the Fl. Colorado. High peaks about Mt. Lincoln, Colorado, and in Arctic America.

Var. **Johannis,** Regel. Scape naked or with a single leaf, *glabrous: leaves ovate, with a short woolly pubescence: pods long, linear, and with the pedi-*

[1] *Camelina,* an introduced genus, is distinguished by its pear-shaped pod, 1-nerved valves, incumbent cotyledons, and small yellow flowers. See foot-note, p. 25.

[2] *Raphanus,* an introduced genus, is known by its elongated 1-celled or transversely-jointed pod, which is attenuated above. See foot-note, p. 27.

cels glabrous. — *D. muricella,* Wahl.? of Bot. King's Exp. 21; *D. nivalis* of Hayd. Rep. 1870. Uinta Mountains and far northward.

2. **D. crassifolia,** Grah. Scape naked or with a single leaf, 1 to 3 inches high: *leaves lanceolate-linear,* entire or somewhat serrate, *ciliate with simple hairs:* flowers small, *yellow or white: petals a little exceeding the sepals,* retuse: pods ovate-elliptical, glabrous. — Alpine, from Colorado northward, and in California.

3. **D. alpina,** L. Rather rigid: *scape naked,* mostly somewhat hirsute: *leaves spatulate-lanceolate, more or less pilose with branching hairs: petals yellow, more than twice the length of the sepals:* pods somewhat corymbed, oblong-elliptical. — Alpine, Colorado, Uintas, and northward to Arctic America.

Var. **glacialis,** Dickie. *Dwarf:* leaves more rigid, *linear or narrowly oblanceolate,* more or less strongly carinate, *stellate pubescent,* not ciliate: *pods short-ovate, pubescent.* — *D. glacialis* of Hayd. Rep. 1871, 1872. Peaks about Yellowstone Lake and far northward.

* * *Stems leafy.*

+ *Flowers white.*

4. **D. incana,** L. *Hoary pubescent, seldom branching at the base: leaves oblong-lanceolate, linear,* or the lower spatulate: *pods oblong-lanceolate,* often pubescent, *on short erect pedicels.*

Var. **confusa,** Poir. Leaves sparingly toothed: pods pubescent. — Mountains of Colorado and in British America.

5. **D. cuneifolia,** Nutt. *Hirsute-pubescent* throughout with branching hairs, *usually branching at base,* leafy below or only at base: *leaves obovate or spatulate with a narrow or cuneate base,* sparingly toothed toward the apex: *pods linear-oblong,* somewhat pubescent with short ascending hairs, *on spreading pedicels.* — Southern Colorado, eastward, and probably westward.

+ + *Flowers yellow (white in one variety of No. 7).*

++ *Pods glabrous (except in one variety of No. 7).*

6. **D. stenoloba,** Ledeb. *Somewhat villous with spreading hairs,* glabrous above: stems erect, with divergent or decumbent branches near the base: *leaves oblanceolate,* rather thin, rarely and sparingly toothed; the cauline few and sessile: petals bright or pale yellow: *pods linear,* in an elongated raceme *on spreading scattered pedicels; style none.* — *D. nemorosa,* var. *lutea,* of Bot. King's Exp. 22. Colorado mountains, the Uintas and Wahsatch, and westward to California.

7. **D. nemorosa,** L. *Leaves oblong or somewhat lanceolate,* more or less toothed: racemes elongated: petals emarginate, small: *pods elliptical-oblong, half the length of the horizontal or widely spreading pedicels.*

Var. **leiocarpa,** Lindb. Often with stem nearly or quite leafless, and petals sometimes pinkish-white: sepals sparsely hirsute: *pedicels scarcely exceeding or even shorter than the glabrous pods.* — *D. nemorosa,* var. *lutea,* of Fl. Colorado and Hayd. Rep. 1871. Colorado and throughout Yellowstone Park.

Var. **hebecarpa,** Lindb. Pubescent: stem branched: *pods pubescent, one third the length of the pedicels.* — *D. nemorosa* of Bot. King's Exp. 22 and Hayd. Rep. 1871. In the mountains from Colorado to Arctic America.

8. **D. chrysantha,** Watson. Stems decumbent or erect from a branching rootstock, *which becomes covered with the persistent bases of dead leaves,* sparingly pubescent with simple hairs: basal leaves narrowly oblanceolate, mostly entire; the cauline oblanceolate to lanceolate: *flowers bright yellow:* pod oblong, acute at each end and *beaked by a slender style.* — Proc. Am. Acad. xvii. 364. In the high mountains of Colorado and southward into Arizona.

++ ++ *Pods not glabrous.*

9. **D. montana,** Watson. *Hoary-villous with simple or branching rigid hairs, rather stout,* erect, simple or sparingly branched, becoming a span high or less: *leaves rosulate and rather crowded at and above the base of the stem,* oblanceolate, sparingly toothed: pods *linear-oblong,* obtusish, *roughly puberulent,* nearly erect upon spreading pedicels; *style none.* — Wheeler's Rep. vi. 63. Colorado.

10. **D. aurea,** Vahl. *More or less canescently stellate pubescent* and usually somewhat villous with branching hairs: stems 3 to 18 inches high, solitary or several from the same root, simple or branched: leaves oblanceolate, petioled; the upper sessile, oblong to oblong-ovate, entire or sometimes sparingly toothed: *petals yellow fading to white: pods linear-lanceolate, attenuate upward into a short style, puberulent, often somewhat twisted.* — From Colorado to British America.

Var. **stylosa,** Gray. Style as long as in the next. — Southwestern Colorado.

11. **D. streptocarpa,** Gray. A span high, *with simple or simply forked, long, rigid, shaggy, spreading hairs:* radical leaves rosulate, spatulate-lanceolate, *attenuated into a large-margined petiole;* cauline very entire, sessile: racemes often paniculate: *petals golden-yellow: pods linear or oblong-ovate, minutely or strongly hispid-ciliate, usually much twisted* with often 3 or 4 turns; *style long.* — In the mountains of Colorado to the very summit, the alpine forms being much dwarfed.

12. **D. ventosa,** Gray. *Depressed and cespitose, canescently tomentose* throughout, the pubescence stellate: *leaves crowded on the mostly tufted branches,* spatulate-oblong or obovate, entire: peduncle in fruit exserted beyond the leaves: *petals golden-yellow: pod oval or orbicular, tomentulose-hirsute, tipped with a short distinct style.* — Am. Naturalist, viii. 212. "On a high rocky peak overlooking Snake and Wind River valleys," *Parry.*

2. CARDAMINE, L. Bitter Cress.

Sepals equal. Pod linear, seeds in one row. — Growing in wet places, usually with running rootstocks or small tubers; leaves all petioled, simple or pinnate.

1. **C. cordifolia,** Gray. *Stem 1 to 3 feet high,* erect, simple, *leafy to the top:* leaves *cordate, sparingly repand-dentate or angular-toothed,* ciliate, 2 to 4 inches across; lowest orbicular; upper triangular-cordate: *flowers rather large:* *pods erect.* — *C. rhomboidea* of Hayd. Rep. 1871. From New Mexico and Colorado to Oregon.

2. **C. Breweri,** Watson. *Stem 6 to 18 inches high,* flexuous, *decumbent at base,* usually simple: *leaflets 1 or 2 pairs,* rounded or oblong, *the terminal much*

the largest, entire or coarsely sinuate-toothed or lobed, often cordate at base; radical leaves mostly simple and cordate-reniform: pods obtuse or scarcely beaked with a short style, *ascending*. — Proc. Am. Acad. x. 339. *C. pauciseeta* of Hayd. Rep. 1870, 1871, 1872. From Wyoming to California and Oregon.

3. **C. hirsuta,** L. *Stem 3 to 12 inches high*, erect or ascending from *a spreading cluster of root-leaves: leaflets 3 to 7 pairs*, rounded; those of the upper leaves oblong or linear and *often confluent: flowers small: pods erect or ascending in line with the pedicels;* style very short or almost none. — From Colorado to Alaska and eastward across the continent.

3. PARRYA, R. Br.

Style rather short; lobes of the stigma connate. Seeds flat, orbicular, with a broad membranous border. — Low herbs, with thick perennial roots and numerous scapes with racemed flowers.

1. **P. nudicaulis,** Regel. Rootstock fusiform: scape 4 to 6 inches high: leaves broadly lanceolate, incisely toothed: petals rose-color or purple, retuse: pods broadly linear, erect, slightly incurved, somewhat constricted between the seeds, which are slightly corrugated.

Var. **aspera,** Regel. Pilose with glandular hairs.

Var. **glabra,** Regel. Whole plant glabrous. — Both varieties are included in the *P. macrocarpa* of Bot. King's Exp. 14 and Torr. & Gray, Fl. i. 88. Near the summit of one of the highest peaks of the Uintas (*Watson*).

4. ARABIS, L. Rock Cress.

Anthers short, hardly emarginate at base. Stigma entire or somewhat 2-lobed. Pod linear. Seeds flat and usually winged. — Erect, with perpendicular roots and undivided leaves, the cauline usually clasping and auricled at base.

* *Biennials: pods erect or ascending: flowers small, white or nearly so.*

1. **A. perfoliata,** Lam. *Glaucous: stem stout*, usually simple, 2 *to* 4 *feet high, mostly glabrous* but often hirsute toward the base: lower leaves spatulate, *sinuate-pinnatifid or toothed;* the cauline entire, ovate or ovate-lanceolate, *clasping by the sagittate base: petals little exceeding the sepals: pods erect and usually appressed*, narrowly linear; *style short: seeds in two rows*, narrowly winged or wingless. — Across the continent and far northward.

2. **A. hirsuta,** Scop. *Rough-hairy*, sometimes smoothish, 1 *to* 2 *feet high:* leaves often rosulate at the base; the cauline ovate to oblong or lanceolate, entire or toothed, *partly clasping by a somewhat sagittate or cordate base:* petals greenish-white, *longer than the sepals: pedicels and pods strictly upright; style scarcely any: seeds in one row, wingless.* — Colorado and northward, and eastward across the continent.

3. **A. spathulata,** Nutt. *Hirsute, dwarf and somewhat cespitose, about 4 inches high:* root thick, crowned with vestiges of former leaves and stems: *leaves spatulate-oblong, entire;* radical leaves on rather long petioles: *petals about twice the length of the sepals:* pedicel about half the length of the pod, which is *rather short, diverging, pointed with a distinct slender style: seeds with*

a narrow margin. — Along the Platte and westward to W. Nevada and Oregon.

4. **A. lyrata,** L. *Low, diffuse or spreading from the base, mostly glabrous, except the lyrate-pinnatifid root-leaves;* cauline leaves scattered, spatulate or linear *with a tapering base: petals much longer than the yellowish sepals: pods ascending or spreading: seeds marginless.* — From Colorado northward and eastward.

* * *Mostly perennials: pods usually erect or ascending flowers mostly larger and deeper-colored.*

5. **A. Drummondii,** Gray. *Scarcely glaucous,* 1 *to* 2 *feet high:* stem-leaves lanceolate or oblong-linear and sagittate, or the lowest spatulate: *petals white or rose-color,* fully twice the length of the sepals: *pedicels and pods loosely erect or ascending or spreading:* seeds wing-margined. — Throughout the whole Rocky Mountain region and eastward across the continent. Very variable.

6. **A. Lyalli,** Watson. *Bright green or glaucous and glabrous,* sometimes villous below, rarely more or less canescent with stellate pubescence: stems slender from a branching base, 2 *to* 15 *inches high:* radical leaves oblanceolate, entire; cauline oblong-lanceolate, clasping by a sagittate base: *petals light pink,* twice longer than the sepals: *style none: seeds in* 2 *rows, narrowly winged.* — Proc. Am. Acad. xi. 122. *A. Drummondii,* var. *alpina,* of Fl. Colorado and Hayd. Rep. 1871, 1872. Alpine and subalpine. Colorado, Utah, Wyoming, and westward.

7. **A. canescens,** Nutt. *Densely and finely stellate-pubescent,* 2 *to* 6 *inches high, tufted:* leaves narrowly linear-oblanceolate to broadly spatulate, entire; cauline oblong and clasping: *petals pale-purple:* pods glabrous, tipped by a thick nearly sessile stigma, *more or less spreading or reflexed on short pedicels: seeds in* 1 *row, broadly winged.* — Wyoming to Nevada and California.

* * * *Perennial: pods reflexed or recurved: style none.*

8. **A. Holbœllii,** Hornem. More or less stellate-pubescent, rarely hirsute or even glabrous: stem ½ to 2 feet high, simple or branching: lower leaves spatulate, entire or denticulate: petals twice longer than the sepals, white or rose-color or rarely purple, becoming reflexed. — *A. retrofracta,* Grah. From the Sierra Nevada to New Mexico and Arctic America, and eastward to the Saskatchewan.

5. STREPTANTHUS, Nutt.

Anthers elongated, sagittate; longer filaments sometimes connate. Stigma simple. Pod linear. Seeds flat, broadly winged. — Ours is a perennial, with stem-leaves clasping by a broad auriculate base.

1. **S. cordatus,** Nutt. Glabrous or glaucous: stem simple, 1 to 2 feet high, rather stout: leaves thick, usually repandly toothed toward the apex, the teeth often setosely tipped; lower leaves spatulate-ovate or obovate; cauline cordate to oblong or ovate-lanceolate: petals about half longer than the sepals, greenish-yellow to purple: pods nearly straight, loosely spreading. — Mountains of Arizona, Colorado, and Wyoming, and west to the Sierra Nevada.

6. CAULANTHUS, Watson.

Sepals large, nearly equally saccate at base. Anthers linear, curved. — Ours are stout perennials, with lyrate and entire leaves and greenish-yellow flowers.

1. **C. hastatus,** Watson. Glabrous, simple or somewhat branched: leaves petioled, very variable; radical ones lyrate or entire, the terminal leaflet ovate, hastate, or truncate at base, the lateral leaflets very small; cauline ovate-oblong, entire, hastate, rounded or cuneate at base: flowers in a loose virgate raceme, reflexed: sepals narrow, distant: petals (sometimes nearly wanting) equalling the sepals, toothed on the sides: pods spreading. — Bot. King's Exp. 28, with plate. On shaded slopes in the Wahsatch and Uinta Mountains.

7. THELYPODIUM, Endl.

Sepals narrow, equal at base. Anthers linear, curved. — Mostly stout and coarse biennials.

* *Leaves entire.*

1. **T. integrifolium,** Endl. *Stem* 3 *to* 5 *feet high, attenuated upward and sending out numerous branches toward the summit: radical leaves petioled, oblong-elliptical;* cauline lanceolate, *sessile,* uppermost nearly linear: flowers crowded, *pale rose-color:* pedicels almost horizontal: pod short, abruptly pointed, *on a short stipe.* — From New Mexico to the Upper Missouri and Oregon; also in California.

2. **T. linearifolium,** Watson. *Stem* 1 *foot or more high,* often branched from the base, *erect,* paniculate at the top: *leaves linear,* or the lower lanceolate, *sessile:* sepals turning purplish: *petals rose-purple:* pods erect, on spreading pedicels, very slender, teretish, *apiculate with a very short style.* — Bot. King's Exp. 25. *Streptanthus linearifolius,* Gray. Wyoming, Colorado, and southward.

3. **T. sagittatum,** Endl. *Stems weak, rarely erect,* 12 *to* 18 *inches high: radical leaves long-petioled, lanceolate; cauline sagittate and clasping:* sepals purplish: *petals pale pink:* pods somewhat torulose, *acuminate with the rather long style,* spreading. — W. Wyoming, S. W. Montana, to Utah and Nevada.

4. **T. Nuttallii,** Watson. Resembling the last but *stouter and more erect,* 3 *to* 5 *feet high: radical leaves ovate: sepals and petals bright purple,* rarely whitish. — Bot. King's Exp. 26. *Streptanthus sagittatus,* Nutt. Wyoming and Montana to Oregon and California.

* * *At least the radical leaves toothed.*

5. **T. Wrightii,** Gray. Stem 2 to 3 feet high: leaves lanceolate, repand-dentate or denticulate, all narrowed into a short petiole: flowering racemes short and dense; pedicels divaricate: petals scarcely exceeding the sepals: pods widely spreading, on a very short stipe. — Colorado and southward.

8. STANLEYA, Nutt.

Sepals narrow, spreading, yellow. Petals with long connivent claws. Filaments much elongated. — Stout perennials with large flowers in elongated racemes.

1. **S. pinnatifida,** Nutt. Stems 2 to 3 feet high, *decumbent at base: lower leaves lyrate-pinnatifid;* upper leaves entire, *lanceolate, narrowed at base to a slender petiole:* pods somewhat torulose, twice longer than the stipe. — *S. integrifolia,* James. From Arizona and New Mexico to the head-waters of the Missouri, eastward to Western Iowa, and westward to California.

2. **S. tomentosa,** Parry. Stems 1 to 3 feet high, *very stout, white-villous or hirsute throughout:* radical and lower leaves as in the last; upper ones entire and *hastate,* passing into lanceolate and finally subulate bracts: raceme very dense and thick, cylindrical, becoming 1 to 1½ feet long, with pale cream-colored flowers. — Am. Naturalist, viii. 212. "Owl Creek, Wyoming, on dry slopes," *Parry.*

3. **S. viridiflora,** Nutt. Stems 2 to 4 feet high, simple, *erect, glabrous: radical leaves obovate or lanceolate, entire* or with a few runcinate teeth towards the base; cauline *lanceolate, clasping:* sepals and petals greenish-yellow: pods torulose. — N. Nevada, Utah, Wyoming, and northward.

9. ERYSIMUM, L.

Sepals erect, the alternate ones strongly gibbous at base. Petals long-clawed, with a flat blade. — Leaves not clasping; the flowers often large, yellow or orange, or occasionally purple.

* *Flowers small: pods small and short.*

1. **E. cheiranthoides,** L. Minutely roughish, slender, branching: leaves lanceolate, scarcely toothed: pods very obtusely angled, ascending on slender divergent pedicels. — From Colorado to Arctic America and westward.

* * *Flowers showy: pods elongated.*

2. **E. asperum,** DC. *Canescent with short appressed hairs:* stems solitary and simple, rarely branched above: *leaves oblanceolate or narrowly spatulate;* the cauline linear to linear-lanceolate, *entire or sparingly repand: petals light yellow to deep orange or purple: pods ascending on stout spreading pedicels.* — From Mexico to British America, and from California to Texas and Ohio.

Var. **Arkansanum,** Gray. *Minutely roughish-hoary: leaves lanceolate,* somewhat toothed: *pods nearly erect on very short pedicels, exactly 4-sided.* — On the plains and in the mountains of Colorado and eastward.

3. **E. pumilum,** Nutt. *Somewhat scabrous: stems 2 to 4 inches high: leaves linear, all entire:* flowers pale yellow: pods flatly 4-sided, very long, *erect, on very short pedicels.* — *E. asperum,* var. *pumilum,* and *Hesperis Pallasii* of Fl. Colorado. Alpine in Colorado, also in the foothills of Nevada.

4. **E. parviflorum,** Nutt. *Canescent and scabrous:* stem low and simple: *leaves all linear* or somewhat lanceolate, *almost wholly entire, densely clustered at the base of the stem: flowers small, sulphur-yellow: pods erect.* — *E. asperum,* var. *inconspicuum,* of Bot. King's Exp. 24 and Bot. Calif. i. 39. Nevada to the Saskatchewan.

10. BARBAREA, R. Br. Winter Cress.

Valves somewhat carinate. Seeds in one row, turgid, marginless. — Erect and branching, with angled stems.

1. **B. vulgaris,** R. Br. Stem 1 to 3 feet high: lower leaves lyrate-pinnatifid, with a larger rounded terminal lobe and 1 to 5 pairs of lateral ones; upper leaves obovate, more or less pinnatifid at base: pods erect, often appressed. — From Oregon eastward.

11. SISYMBRIUM,[1] L. Hedge Mustard.

Sepals scarcely gibbous at base. Seeds not margined. — Erect herbs, with small flowers, the leaves not clasping or auriculate, rarely entire.

* *Leaves pinnate or bipinnate.*

1. **S. canescens,** Nutt. *Canescent with short branching hairs:* stems ½ to 2½ feet high: leaves 1 to 2-pinnate, with the segments more or less deeply pinnatifid or toothed: pods acute at each end and pointed with the very short style, *shorter than the slender spreading pedicels: seeds in two rows.* — Very common on the plains and in the mountains. From Colorado to Arctic America, westward to California, and eastward to New York and Pennsylvania.

2. **S. incisum,** Engelm. *Pubescence short, more or less glandular:* stems 1 to 4 feet high: leaves pinnate, with the segments linear to ovate-oblong, more or less deeply pinnatifid, sometimes entire: pods pointed at both ends, *mostly exceeding the spreading pedicels: seeds in one row.* — *S. Californicum,* Watson in Bot. King's Exp. 23. Oregon and Washington Territory, eastward to Winnipeg Valley and southward to New Mexico.

* * *Leaves entire or toothed.*

3. **S. glaucum,** Nutt. *Glaucous,* about 1 foot high: radical leaves small, *spatulate; cauline ovate, sagittate and clasping,* rather acute: *flowers very small, pale purple:* pods erect: *seeds in one or two rows.* — South Park, Colorado, and northwestward to Oregon.

4. **S. virgatum,** Nutt. *Canescently hirsute with simple and stellate hairs:* stem about a span high, *virgately branched from the base: leaves lanceolate-linear, clasping;* lower ones denticulate or entire: flowers larger, *pale purple:* pods erect: *seeds in two rows.* — On the Platte and its tributaries.

5. **S. linifolium,** Nutt. *Glabrous and glaucous,* 1 to 1½ feet high: *leaves narrowly oblanceolate or linear: flowers light yellow:* pods ascending on short spreading pedicels, with short thick styles: *seeds in one row.* — *S. junceum* of Hayd. Rep. 1871, 1872. W. Wyoming and northwestward through Montana and Idaho.

[1] Brassica is an allied genus, represented in our range by the following introduced species: —

B. Sinapistrum, Boiss. Known by its rough spreading hairs, lower leaves usually with a large coarsely toothed terminal lobe, upper leaves often undivided, and the pods more than a third occupied by the stout 2-edged beak. — Around settlements in S. Montana and Idaho, and undoubtedly elsewhere.

12. SMELOWSKIA, C. A. Meyer.

Dwarf alpine perennials, distinguished from *Sisymbrium* by the short 4-angled pods.

1. **S. calycina,** C. A. Meyer. Densely white-tomentose to nearly glabrous, cespitose, the much-branched rootstock thickly covered with the sheathing bases of dead leaves: leaves mostly radical and with long slender petioles, pinnate or pinnatifid; segments linear to oblong: pod beaked with a short style and broad stigma, ascending on spreading pedicels: seeds in one row. — From Colorado to California and Oregon, and northward.

13. NASTURTIUM, R. Br. Water-Cress.

Growing in water or in moist places, smooth or nearly so, with the leaves pinnatifid or lyrate.

* *Flowers small, yellow or yellowish.*

1. **N. obtusum,** Nutt. Glabrous or nearly so: stems much branched: *leaves pinnately parted or divided, often lyrate, decurrent; segments oblong-roundish, obtusely toothed or repand:* racemes elongated in fruit: pods ovate to linear-oblong, *twice the length of the pedicels; style short.* — From Colorado to the headwaters of the Yellowstone and eastward. Growing in the spray of the Lower Falls of the Yellowstone.

Var. (?) **alpinum,** Watson. *Dwarf: leaves oblong, entire or with a few teeth or coarsely lyrate-pinnatifid: pods mostly shorter than the pedicels.* — Bot. King's Exp. 15. Uinta Mountains.

2. **N. palustre,** DC. *Stout,* glabrous, *erect,* 1 to 3 feet high: *leaves lanceolate, lyrately-pinnatifid, petioled:* pods oblong, *equalling the spreading pedicels, tipped by the prominent style.* — E. California to Colorado, thence northward and eastward.

Var. **hispidum,** Fisch. & Meyer. *Somewhat hispid: pods shorter, globose-*oblong. — The more common form.

3. **N. curvisiliqua,** Nutt. Smooth, *usually erect,* ½ to 1 foot high: *leaves narrowly oblong or oblanceolate, pinnatifid with oblong usually toothed lobes,* rarely only sinuate-toothed: pods rather slender on pedicels of about the same length, *both often strongly curved;* style prominent or none. — W. Wyoming and Idaho to Washington Terr. and California.

4. **N. sinuatum,** Nutt. *Stems diffuse, slender, decumbent,* smooth or slightly roughened, from *perennial creeping or subterranean shoots: leaves lanceolate, usually narrow, regularly sinuate-pinnatifid* with numerous linear-oblong nearly entire lobes: pods linear, *tipped with the long style, becoming curved,* as also the slender pedicel. — From New Mexico to the Upper Mississippi and westward to the Sierra Nevada.

* * *Flowers white.*[1]

5. **N. trachycarpum,** Gray. Nearly glabrous, erect, branching: leaves lyrate-subpinnatifid: pods oblong-linear, *papillose-roughened,* curved-

[1] *N. officinale,* R. Br., is a smooth procumbent aquatic rooting at the joints, with pinnate leaves and sinuate leaflets, and with spreading pedicels and a short thick style. — Introduced in the streams about Denver and Salt Lake City, and doubtless elsewhere.

ascending on stout pedicels, soon recurved, shorter than the long subulate style. — Proc. Am. Acad. xii. 54. S. W. Colorado on the San Juan, etc., *Brandegee.*

14. VESICARIA,[1] Tourn. Bladder-pod.

Low densely stellate-canescent herbs, with large yellow flowers, entire or sinuately toothed leaves, and long slender styles.

* *Pod smooth.*

1. **V. Fendleri,** Gray. Low, spreading from a thick woody caudex: leaves linear or linear-spatulate, crowded, mostly entire: raceme densely many-flowered: pod membranaceous. — Pl. Fendl. 9. *V. stenophylla,* Gray, of Fl. Colorado, 6. Southern Colorado and southward.

* * *Pod hairy.*

2. **V. Ludoviciana,** DC. *Stem simple* or somewhat branched above: *radical leaves spatulate,* entire; *cauline linear: pod oborate, globose, a little longer than the style.* — Colorado and Wyoming.

3. **V. montana,** Gray. *Stems spreading,* leafy: *radical leaves subovate,* petioled, sometimes 1 or 2-toothed; *cauline spatulate: fruiting raceme elongated: pod oval or ellipsoidal, a little longer than the style* and a little shorter than the upwardly curving spreading pedicel. — Mountains of Colorado and Wyoming, also in California and Oregon.

4. **V. alpina,** Nutt. *Dwarf and cespitose:* leaves linear-spatulate, entire: flowers in short corymbose racemes, large for the size of the plant: *pod inflated below, compressed at the summit, shorter than the style, densely clothed* with stellate hairs. — W. Wyoming and S. W. Montana.

15. SUBULARIA, L. Awlwort.

A dwarf stemless aquatic, smooth, with tufted subulate leaves, few minute white flowers, and no style.

1. **S. aquatica,** L. Scapes 1 to 3 inches high: leaves usually shorter than the scapes: flowers scattered: petals not exserted: pods obtuse, about equalling the pedicels. — In great abundance at the head of Yellowstone Lake, *Parry.* The next stations to the east are in New Hampshire and Maine.

16. CAPSELLA, Mœnch. Shepherd's Purse.

Slender and mostly smooth annuals, with small white flowers and simple or pinnate leaves.[2]

1. **C. divaricata,** Walp. Glabrous, very slender and diffusely branched: radical leaves pinnate or pinnatifid with few lobes; the upper oblanceolate to linear, entire: pods elliptic-oblong, on very slender spreading pedicels. — Colorado, W. Wyoming, and westward.

[1] *Camelina sativa,* Crantz., is an annual, with lanceolate arrow-shaped leaves, and large margined pods. — Known as "False Flax," and introduced in Colorado, etc.

[2] *C. Bursa-pastoris,* Mœnch, is usually somewhat hirsute at base, with radical leaves mostly runcinate-pinnatifid, cauline lanceolate and auricled at base, and pods cuneate-triangular, truncate above. — Naturalized wherever civilized man is found.

17. THLASPI, L. Pennycress.

Pod usually emarginate. Style rather long. Seeds somewhat turgid. — Low glabrous herbs with simple stems; lower leaves rosulate, entire or toothed, the cauline oblong, auricled and clasping; flowers white or pinkish.

1. **T. alpestre,** L. Radical leaves petioled, ovate or obovate: pods acutely margined but not winged. — *T. cochleariforme,* DC., of Hayd. Rep. 1872; *T. Fendleri,* Gray, of Hayd. Rep. 1870. From New Mexico to British America and westward.

18. LEPIDIUM, L. Peppergrass.

Low herbs with pinnatifid or toothed leaves and small white flowers.

* *Petals none: stamens* 2 *or* 4.

1. **L. intermedium,** Gray. Erect and branching, puberulent or glabrous: lower leaves toothed or pinnatifid; the upper often entire, oblanceolate or linear: pod smooth or rarely puberulent, very shortly winged with somewhat divergent obtuse teeth, on spreading pedicels. — *L. ruderale* of Hayd. Rep. 1870. From Texas to Hudson's Bay, and westward to S. California and the Columbia Valley. Forms with small petals are reported from Utah, New Mexico, Texas, etc.

* * *Petals conspicuous: stamens* 6.[1]

2. **L. montanum,** Nutt. Decumbent, branches many from a long somewhat woody root, spreading in a circular manner: *radical leaves more or less bipinnatifid; upper leaves trifid or entire: pods indistinctly reticulated, elliptical, slightly emarginate, wingless, with a conspicuous style.* — Plains from New Mexico to the British boundary, and in California.

3. **L. alyssoides,** Gray. Stems diffuse, branches minutely puberulent: *leaves narrowly linear, mucronulate, attenuate at base, very entire,* lowest often pinnately lobed: *racemes dense, corymbose: pods ovate, shortly winged above with acutish teeth,* scarcely emarginate, *with a very short style.* — In dry valleys and on hillsides from N. Nevada through Colorado to Mexico.

4. **L. Fremontii,** Watson. Glabrous and glaucous, diffusely branched, from a somewhat woody base: *leaves linear, entire or sparingly lobed: racemes rather short and few-flowered:* pods rounded, *abruptly cuneate at base, slightly emarginate with short very obtuse teeth.* — Bot. King's Exp. 30, with plate. S. Colorado and through S. Utah to Nevada and California.

19. PHYSARIA, Nutt.

Low and stellately canescent plants, distinguished by the inflated, nearly globular cells of the didymous pod.

1. **P. didymocarpa,** Gray. Decumbent, diffusely branched: radical leaves broadly spatulate, occasionally lyrate; cauline oblanceolate: flowers showy: pods deeply emarginate above and below, the cells usually approximate, but sometimes divergent. — From Colorado to British America and westward to the Sierra Nevada.

[1] *L. sativum,* L., has leaves variously divided and cut, with very numerous round-oval winged pods, and flowers sometimes rose-color. — Introduced in Colorado, Utah, and elsewhere.

20 BISCUTELLA,[1] L.

Erect stellate-pubescent branching herbs, with entire or pinnatifid leaves, and yellow or purplish flowers.

1. **B. Wislizeni,** Benth. & Hook. A foot or more high, covered throughout with a fine, but dense, stellate pubescence: leaves linear-lanceolate to broadly lanceolate, entire, slightly undulate or deeply pinnatifid: each half of the pod roundish. — *Dithyræa Wislizeni*, Engelm., of the various Western reports. S. W. Colorado, *Brandegee*, to Arizona and Texas.

Order 7. CAPPARIDACEÆ. (Caper Family.)

Herbs, with alternate leaves and perfect hypogynous flowers, sepals and petals as in *Cruciferæ*, stamens 6 or more, nearly equal in length, pod one-celled with 2 parietal placentæ and kidney-shaped seeds, the embryo incurved rather than folded.

* Stamens 8 to 32.

1. **Polanisia.** Flowers whitish or purple. Pod elongated.

* * Stamens 6.

2. **Cleome.** Flowers yellow or pink-purple. Pod oblong or linear, many-seeded.
3. **Cleomella.** Flowers yellow. Pod rhomboidal, 2-horned or globular, few-seeded.

1. POLANISIA, Raf.

Sepals sometimes united at base. Petals with claws and emarginate. Pod compressed or cylindrical, many-seeded. — Annual herbs, ill-scented and mostly glandular, with 3-foliolate petioled leaves, and flowers in leafy bracted racemes.

1. **P. trachysperma,** Torr. & Gray. *Leaves with 3 lanceolate leaflets;* floral bracts mostly simple: petals with slender claws as long as the sepals: *stamens 12 to 16, exserted:* pod very rarely on a short slender stipe: *seeds finely pitted and often warty.* — *P. uniglandulosa* of the Fl. Colorado and Bot. King's Exp. Colorado and Wyoming to the Columbia River, and eastward to Kansas and Texas.

2. **P. graveolens,** Raf. *Leaves with 3 oblong leaflets:* flowers small: calyx and filaments purplish: petals yellowish-white: *stamens about 11, scarcely exceeding the petals: pod slightly stipitate.* — Upper Arkansas Valley, Colorado, and eastward across the continent.

2. CLEOME, L.

Sepals sometimes united at base. Pod stipitate, many-seeded. — Erect branching annuals, with palmately 3 to 7-foliolate leaves, flowers in bracteate racemes, and pods pendent on spreading pedicels.

[1] *Raphanus sativus*, L., is more or less hispid, with purple or rose-colored flowers, and an inflated long-pointed pod. — The common Radish, running wild in cultivated grounds.

1. **C. lutea,** Hook. Smooth or slightly pubescent, 1 to 2 feet high: *leaflets* 5, *linear- to oblong-lanceolate:* flowers showy, *bright yellow,* corymbose, the raceme elongated in fruit: stamens much exserted: pod equalling or much longer than the stipe. — *C. aurea,* Nutt. Abundant in the valleys of Colorado and Wyoming, and westward to Nevada and Oregon.

2. **C. integrifolia,** Torr. & Gray. Somewhat glaucous, 2 to 3 feet high: *leaflets* 3, *lanceolate* (the lowest oblong): flowers large, showy, *reddish-purple,* rarely white, the raceme sometimes nearly a foot long: pods compressed, much longer than the stipe. — From Colorado to the Upper Missouri and eastward.

3. **C. Sonoræ,** Gray. Glabrous: *leaflets* 3, *linear: flowers purplish: pod turgid, somewhat longer than the stipe, which is much shorter than the pedicel.* — Pl. Wright. ii. 16. S. Colorado (*Brandegee*) and southward.

3. CLEOMELLA, DC.

Like *Cleome,* but the pod few-seeded, small and ovoid-globose or rhomboidal. — Erect branching annuals, with yellow racemose flowers and 3-foliolate leaves.

1. **C. angustifolia,** Torr. *Branching above:* leaflets oblong-linear: pod many times longer than the style, shorter than the stipe, *dilated-rhomboid: seeds transversely rugulose.* — Colorado and southward. Distributed in the earlier Colorado collections by mistake under the name of *C. tenuifolia.*

2. **C. oöcarpa,** Gray. *Diffuse:* leaflets oblong-linear: raceme frequently densely flowered: pod with a somewhat shorter style, much shorter than the stipe, *ovate: seeds* 1 *or* 2, *smooth.* — Proc. Am. Acad. xi. 72. On the borders of the Mesa Verde, S. W. Colorado; also in Nevada.

Order 8. VIOLACEÆ. (Violet Family.)

Herbs, distinguished by the irregular one-spurred corolla of 5 petals, 5 stamens, adnate introrse anthers conniving over the pistil, which has a single club-shaped style, a one-celled ovary with 3 parietal placentæ. — Flowers perfect, with persistent sepals. Each of the 3 valves of the capsule, after dehiscence, in drying firmly folds together lengthwise and by its increasing pressure projects the obovate seeds.

1. **Viola.** Sepals auricled. Lower petal spurred at base.
2. **Ionidium.** Sepals not auricled. Lower petal unguiculate, the claw dilated and shortly gibbous or concave.

1. VIOLA, L. Violet.

Anthers often coherent, the connectives of the two lower bearing spurs which project into the spur of the petal. — Mostly perennial herbs with alternate leaves, foliaceous persistent stipules, and 1-flowered axillary peduncles. The later flowers are often cleistogamous.

* *Stemless, the leaves and scapes all from a subterranean rootstock: flowers purplish or violet (sometimes white).*

1. **V. palustris,** L. Smooth: *rootstock slender: leaves round heart-shaped and kidney-form, slightly crenate: flowers small, pale lilac with purple streaks, nearly beardless: spur very short and obtuse.* — Mountains of Colorado and Utah, and far northward; also in the White Mountains of N. H.

2. **V. cucullata,** Ait. *Rootstock thick and branching, dentate:* leaves long-petioled, smooth or pubescent, *cordate with a broad sinus;* the lowest often reniform and the later acute or acuminate, crenately toothed, *the sides rolled inward when young:* flowers deep or pale violet or purple (sometimes white: *the lateral and often the lower petals bearded:* spur short and thick. — A very variable species, ranging across the continent, but sparingly reported from the Rocky Mountain region of Colorado and Wyoming.

3. **V. delphinifolia,** Nutt. Rootstock short and very thick, erect, *not scaly: leaves all palmately or pedately 5 to 7-parted;* divisions 2 to 3-cleft into linear lobes: flowers pale or deep lilac-purple or blue: lateral petals bearded. — From Colorado across the plains to the Mississippi States.

* * *Leafy-stemmed, perennial from short rootstocks.*

+– *Leaf-bearing from base to summit, erect or ascending.*

++ *Flowers white or purple.*

4. **V. canina,** L., var. **sylvestris,** Regel. *Low (3 to 8 inches high):* stems mostly simple, from the base at length producing creeping branches: leaves heart-shaped or the lowest kidney-form, *crenate; stipules fringe-toothed: petals light violet,* the lateral ones slightly bearded: spur cylindrical, *half the length of the petals: stigma beaked.* — The most common American variety of this very variable and widely distributed species. From Colorado northward and eastward.

Var. **adunca,** Gray. *Leaves ovate,* often somewhat cordate at base, *obscurely crenate:* spur as long as the sepals, *rather slender, hooked or curved.* — Rocky Mountains and westward.

Var. **longipes,** Watson. Very similar, *but the stout obtuse spur is nearly straight.* — Bot. Calif. i. 56. Same range as the last.

5. **V. Canadensis,** L. *Upright, 1 to 2 feet high:* leaves cordate, pointed, *serrate; stipules entire: petals white* or whitish inside, the upper ones mostly tinged with purple beneath, sometimes entirely purple; the lateral ones bearded: *spur very short: stigma beakless.* — Colorado, Montana, Wyoming, and eastward.

++ ++ *Flowers yellow, more or less veined or tinged with purple.*

6. **V. aurea,** Kellogg. More or less pubescent, 2 to 6 inches high: leaves ovate to lanceolate, *cuneate or sometimes truncate at base, coarsely crenate; stipules foliaceous, lanceolate, laciniate: peduncles a little longer than the leaves:* the upper petals more or less tinged with brown on the outside, the others veined with purple: *capsule nearly globular, pubescent.*

Var. **venosa,** Watson. Alpine and more slender: flowers smaller: *leaves often purple-veined.* — Bot. Calif. i. 56. *V. Nuttallii,* var. *venosa,* of Hayd. Rep. 1872. The species belongs to the Sierra Nevada and westward, while the variety ranges eastward to the Wahsatch and Uintas.

7. **V. Nuttallii,** Pursh. From densely pubescent to nearly glabrous: leaves oblong-ovate to oblong, *attenuate into the long petiole, entire or obscurely sinnate; stipules mostly narrow, entire: peduncles usually shorter than the leaves: capsule ovate, smooth.* — From Colorado to the Upper Missouri and Washington Territory; also in California.

+– +– *Stems naked below, two-leaved above.*

8. **V. biflora,** L. Stem weak, 2-leaved and 2-flowered: leaves reniform, very obtuse, crenate; stipules ovate, very entire: flowers very small, yellow: petals marked with brown lines: spurs short. — Colorado.

2. IONIDIUM, Vent.

Petals very unequal, the two upper shorter, the lower one very large. Stamens approximate, the anterior ones each furnished with a nectariferous gland at the base. — Leaves opposite or alternate; peduncles axillary, solitary.

1. **I. lineare,** Torr. Somewhat pubescent: leaves entire or remotely serrulate: the lower varying from lanceolate to oblong or obovate; the upper linear; stipules linear: peduncles articulated, bibracteolate: flowers small. — From Colorado eastward and southward across the plains.

Order 9. POLYGALACEÆ. (Milkwort Family.)

Herbs with simple entire leaves and no stipules, remarkable for the seemingly papilionaceous flowers, monadelphous or diadelphous stamens coherent with the petals, and one-celled anthers opening at the top.

1. POLYGALA, Tourn. Milkwort.

Sepals 5, very unequal, the 2 lateral large and petal-like. Petals 3, united to each other and to the stamen-tube, the middle one hooded above and often crested or beaked. Stamens 6 or 8. Ovary 2-celled: style long, curved, dilated above. Capsule membranaceous, flattened contrary to the narrow partition, often notched above. Seed carunculate at the hilum. — Herbaceous or somewhat shrubby, with racemose or spicate flowers.

1. **P. verticillata,** L. Slender, 6 to 10 inches high: *stem-leaves whorled in fours,* sometimes in fives; *those of the branches scattered, linear:* spikes peduncled, *dense,* slender; *the bracts falling with the flowers,* which are small, *greenish-white* or barely tinged with purple, the crest of the keel conspicuous: *the 2-lobed caruncle half the length of the seed.* — Colorado and eastward across the plains.

2. **P. alba,** Nutt. Smoothish, one foot high, leafy half-way to the summit: *leaves linear to oblanceolate, margins slightly revolute:* flowers deciduous, *leaving the rachis roughened after their fall, white: seed with caruncle extended into two ear-like lobes nearly as long as the seed.* — Plains of the Upper Missouri.

3. **P. acanthoclada,** Gray. *Somewhat shrubby,* 2 feet high, *subcinereous-pubescent, armed with slender spines: leaves linear-spatulate: flowers subaxillary, scattered, white;* pedicels bibracteolate at base: keel short boat-shaped, *with a boss on the back.* — Proc. Am. Acad. xi. 73. S. W. Colorado and S. E. Utah.

Order 10. FRANKENIACEÆ.

Low perennial herbs or undershrubs, with opposite entire leaves and no stipules; distinguished from *Sileneæ* mainly by the parietal placentæ and oval or oblong anatropous seeds with a straight embryo.

1. FRANKENIA, L.

Calyx tubular or prismatic, 4 or 5-lobed. Petals 4 or 5, clawed and bearing a crown. Stamens 6. Ovary 1-celled: style 2 to 4-cleft into filiform divisions. Capsule included in the persistent calyx. — Leaves small, mostly crowded, and also fascicled in the axils: flowers small, solitary and sessile in the forks of the stem or becoming cymose-clustered on the branches, white.

1. **F. Jamesii,** Torr. Much branched from a woody base, 6 to 10 inches high: leaves linear, strongly revolute on the margins, the fascicled ones shorter: limb of petals erose-denticulate at tip. — S. Colorado.

Order 11. CARYOPHYLLACEÆ. (Pink Family.)

Herbs, with regular and mostly perfect flowers, 4 or 5 persistent sepals, 4 or 5 petals (sometimes wanting), the distinct stamens commonly twice as many, ovary one-celled with a free central placenta, the seeds reniform. — Stems usually swollen at the nodes. Leaves opposite. Styles 2 to 5, mostly distinct. Fruit a capsule opening by valves, or by teeth at the summit. Stipules none in our genera.

Tribe I. Sepals united. Petals with a conspicuous claw, usually with an appendage (crown) at the base of the blade, borne with the stamens on a stipe under the ovary. Capsule dehiscent at the toothed summit. Flowers comparatively large. — Sileneæ.[1]

1. **Silene.** Calyx 5-toothed. Styles 3.
2. **Lychnis.** Calyx 5-toothed or 5-lobed. Styles 4 or 5.

Tribe II. Sepals distinct or nearly so. Petals without crown or distinct claw, inserted with the stamens on the margin of a disk under the sessile ovary, sometimes inconspicuous or wanting. — Alsineæ.

* Styles (when of the same number) opposite the sepals.

3. **Cerastium.** Capsule cylindric, opening at the toothed apex. Petals emarginate or bifid. Styles usually 5.
4. **Stellaria.** Capsule short, splitting to the base. Petals 2-cleft or none. Styles mostly 3.
5. **Arenaria.** Differs from the last chiefly in the entire petals, these rarely wanting.

* * Styles alternate with the sepals and of the same number.

6. **Sagina.** Capsule 4 or 5-valved. Petals entire or wanting. Styles 4 or 5.

1. SILENE, L. Catchfly.

Calyx tubular, 10-nerved. Petals entire, notched, or bifid. Capsule usually 6-toothed. — Annual or mostly perennial herbs.

[1] *Saponaria,* an introduced genus, has a terete calyx, petals not crowned, and two styles. *S. Vaccaria,* L., is a smooth annual, with ovate-lanceolate leaves, pale red flowers in corymbed cymes, and calyx enlarged and wing-angled in fruit. — *Vaccaria vulgaris* of Gray's Manual. Very generally introduced.

* *Annual: flowers in naked panicles: petals entire or obcordate, crowned.*

1. **S. antirrhina,** L. Glabrous, with a part of each joint viscid, erect, slender: leaves lanceolate or linear: flowers in a dichotomous panicle, on long pedicels: calyx becoming expanded by the enlarging ovary: petals pink. — From S. Colorado to British America and eastward across the continent; also in California.

* * *Perennial: petals bifid.*

+ *Peduncles 1-flowered: stems spreading or decumbent.*

2. **S. Menziesii,** Hook. Glandular-puberulent: stems dichotomously branched, leafy: leaves ovate-lanceolate or -oblong: peduncles lateral and terminal, equalling the leaves: petals without a crown: seeds minutely tuberculate, at length nearly black and shining. — From New Mexico to Slave Lake and westward to California.

+ + *Peduncles 3- to many-flowered: stems erect.*

3. **S. multicaulis,** Nutt. Minutely pubescent: *stems numerous, about a foot high,* rigid: *leaves linear-oblanceolate;* upper ones very small: *flowers in threes* on shortish peduncles, *pale red:* calyx ovate-cylindrical: seeds brown, margined with a scaly crest. — From the western slopes of the mountains to the Pacific.

4. **S. Douglasii,** Hook. Minutely pubescent: *stem simple, very slender, 2 to 3 feet high: leaves remote, linear, elongated: flowers few* on slender peduncles, *rose-color or nearly white:* calyx obovate, at length inflated and membranaceous, pubescent. — Montana to Washington Territory and southward to California and the Wahsatch.

5. **S. Scouleri,** Hook. *Stem stout: leaves distant, narrow: racemes subcompressed, narrow,* few-flowered: calyx somewhat dilating, the teeth broad-lanceolate, slightly ciliate: *petals white or pinkish, the broad bifid limb with notched lobes and appendages; claws auricled, woolly-ciliate as well as the filaments.* — In the mountains from New Mexico to British America.

* * * *Perennial, dwarf, tufted, smooth: flowering shoots 1-flowered: petals notched or entire, crowned.*

6. **S. acaulis,** L. Tufted like a moss: leaves linear, crowded: flowers almost sessile, or rarely on a naked peduncle: petals purple or rarely white. — Alpine summits of the whole Rocky Mountain range, and northward to Arctic America: also in the White Mountains of N. H.

2. LYCHNIS, L. Cockle.

Calyx more or less inflated, capsule 5 to 10-toothed, and styles as many as calyx-lobes; otherwise nearly as in *Silene.* — Ours are perennials with linear to oblanceolate leaves.

* *Stems 1-flowered: seeds with a loose membranous margin: dwarf and cespitose, alpine.*

1. **L. montana,** Watson. *Glandular-pubescent above, nearly glabrous below: petals included or nearly so, the emarginate blade not broader than the very narrow claw;* appendages very small: seeds rather broadly margined. — The *L. apetala* of the Fl. Colorado and other Western reports. Mountain peaks of Colorado, and in the Uintas.

2. **L. Kingii,** Watson. *Pubescent throughout: petals exserted,* the short and flat blade rather deeply emarginate; appendages entire or toothed; *claw ciliate, rather broadly auricled:* filaments ciliate. — *L. Ajanensis?* of Bot. King's Exp. 37. Peaks of the Uintas and in N. W. Wyoming.

* * *Flowers rarely solitary: seeds tuberculate.*

3. **L. Drummondii,** Watson. *Rather stout,* finely glandular-pubescent above: *leaves narrowly oblanceolate:* flowers few, on stout often elongated pedicels: *petals included or nearly so,* white or purple, *the entire or emarginate blade narrower than the auricled claw; appendages minute.* — *Silene Drummondii* of the earlier Reports. Colorado, Wyoming, and northward.

4. **L. Parryi,** Watson. *Slender,* finely glandular-pubescent above: *leaves linear:* flowers with the lateral pedicels mostly short: *petals long-exserted,* purplish, *the broad blade cleft to the middle* and with a short narrow lobe on each side; *appendages quadrate or ovate, crenate;* claw broadly auricled. — Proc. Am. Acad. xii. 248. N. W. Wyoming, *Parry.*

3. CERASTIUM, L. Mouse-ear Chickweed.

Stamens 10. Capsule often incurved, thrice the length of the calyx. — Mostly pubescent or hirsute low herbs: flowers white, in terminal leafy or scariously bracted dichotomous cymes.

1. **C. nutans,** Raf. Annual, *viscid-pubescent, erect: leaves narrowly oblong or linear-lanceolate,* clasping, the lowest spatulate: cyme open, *rather many-flowered: pedicels often nodding or reflexed in fruit: petals slightly longer than the sepals: capsule curved.* — Across the continent and southward into northern Mexico.

2. **C. alpinum,** L. *Silky-hirsute, decumbent, few-flowered: leaves elliptical-ovate:* peduncles more or less elongated: *petals bifid, twice the length of the hairy sepals:* capsule nearly twice as long as the calyx.

Var. **Behringianum,** Regel. *Petals and capsule half longer than the calyx,* shorter than the pedicels: *stems 2 to 4-flowered.* — *C. vulgatum,* var. *Behringianum,* of Fl. Colorado, Hayd. Rep. 1872, and Bot. King's Exp. Mountains of Colorado and W. Wyoming.

3. **C. arvense,** L. Perennial, *downy with reflexed hairs, cespitose: leaves linear to linear-lanceolate,* clasping: *cyme few-flowered:* pedicels erect or nodding: *petals nearly twice longer than the sepals: capsule little exceeding the calyx, nearly straight.* — Colorado and northward through Utah, Montana, and Wyoming, and across the continent.

4. STELLARIA, L. Chickweed.

Stamens 10 or fewer. Styles 3, or rarely 2, 4, or 5. Capsule globose to oblong. — Low herbs, mostly diffuse: leaves rarely subulate: flowers white, solitary or cymose: stems mostly 4-angled.

* *Bracts small and scarious.*

† *Petals none.*

1. **S. umbellata,** Turcz. Glabrous: stems very slender, ascending from slender creeping rootstocks, which are covered with orbicular scales: leaves

elliptic or oblong-lanceolate: flowers in a simple or compound open umbel-like few-rayed cyme: pedicels elongated. — Gray, Proc. Acad. Philad. 1863, 59. Mountains of Colorado and northward.

+ + *Petals equalling or surpassing the calyx.*

2. **S. longifolia,** Muhl. Stem erect, weak, *often with rough angles: leaves linear,* acutish at both ends, *spreading: cymes naked and at length lateral,* peduncled, *many-flowered; the slender pedicels spreading.* — From Oregon to British America and across the continent.

3. **S. longipes,** Goldie. *Shining* or somewhat glaucous, *very smooth: leaves ascending, lanceolate* or linear-lanceolate, broadest at the base: *cyme terminal, few-flowered; the long pedicels erect.* — Colorado and northward, thence eastward to Wisconsin and Maine.

Var. **læta,** Torr. & Gray. Branches erect from creeping stems, 3 *to* 6 *inches high: leaves erect, rigid, carinate: sepals rather obtuse.* — With the last, in the mountains.

Var. **Edwardsii,** Torr. & Gray. Branches *an inch or two high: leaves ovate-lanceolate* (the lowest sometimes ovate), *sometimes sparsely ciliate at the base: sepals acutish.* — Mountains of Colorado.

* * *Bracts foliaceous.*

+ *Petals shorter than the sepals, or none.*

4. **S. borealis,** Bigelow. *Erect or spreading: leaves elongated, lance-linear, finely serrulate,* the intramarginal nerve very indistinct: flowers in dichotomous cymes: *seeds smooth.* — Abundant in the mountains of Colorado and northward, and across the continent.

5. **S. obtusa,** Engelm. Like the last, but *prostrate; leaves triangular-ovate, smooth-edged,* 1-nerved, and the delicate reticulated veins *uniting into distinct intramarginal nerves: seeds* (under the lens) *covered with oblong-linear pectinate tubercles.* — Bot. Gazette, vii. 5. W. Colorado on the tributaries of the Gunnison River, *Brandegee;* also in British Columbia.

+ + *Petals exceeding the sepals* (*sometimes wanting in No.* 6).

6. **S. crassifolia,** Ehrhart. *Stems diffuse or erect, flaccid: leaves rather fleshy,* varying from linear-lanceolate to oblong: flowers terminal or in the forks of the stem or of leafy branches: *seeds rugose-roughened.* — Colorado, Montana, and eastward to the Ohio valley.

7. **S. Jamesii,** Torr. *Somewhat viscidly pubescent, rather stout:* leaves linear to ovate-lanceolate: *pedicels divaricate: seeds smooth.* — New Mexico, Colorado, and westward.

5. ARENARIA, L. Sandwort.

Styles 3. Capsule globose or short-oblong. — Mostly low annuals or perennials, usually tufted: with sessile leaves, often subulate and more or less rigid: flowers white, cymosely panicled or capitate.

§ 1. *The 3 valves of the capsule 2-cleft or parted: seeds not appendaged at the hilum: cespitose perennials, mostly scarious-bracted.* — Arenaria proper.

* *Petals exceeding the sepals.*

1. **A. congesta,** Nutt. *Smooth and glaucous:* leaves very narrowly subulate, scabrous on the margin, often pungent: *flowers in* 1 *to* 3 *dense subumbellate*

fascicles, with large dilated membranous bracts: petals nearly twice as long as the sepals: *stigmas capitellate.* — Mountains of Colorado, Utah, and Wyoming, to Washington Territory.

Var. **subcongesta,** Watson. Flowers less densely fascicled and somewhat cymose. — Bot. Calif. i. 69. *A. Fendleri,* var. *subcongesta,* of Bot. King's Exp. and Fl. Colorado. Colorado, S. Idaho, and westward.

2. **A. capillaris,** Poir., var. **nardifolia,** Regel. *More or less glandular-pubescent above:* leaves linear-subulate, pungent: *flowers few in an open cyme; bracts small, lanceolate:* petals half longer than the sepals. — Watson in Bot. Calif. i. 69. *A. nardifolia,* Ledeb., and *A. formosa,* Hook., in Bot. King's Exp. 39. From the British boundary southward to the Wahsatch and California.

* * *Petals about equalling the calyx.*

3. **A. saxosa,** Gray. *Slightly-hispid pubescent: leaves lanceolate: raceme many-flowered, somewhat cymose:* sepals with a distinct almost *keel-like hispid midrib.* — Pl. Wright, ii. 18. S. Colorado and southward.

4. **A. pungens,** Nutt. *Pubescent throughout, cespitose:* leaves linear-subulate, pungent, crowded: *flowers in an open cyme, leafy-bracted: sepals acuminate, pungent: seeds* very few, *smooth.* — W. Wyoming, Teton Mountains, and westward to California.

5. **A. Franklinii,** Dougl. Of similar habit, *but stouter and less pubescent:* stems leafy at base: *flowers fascicled in a rather close cyme: sepals smooth and shining,* scariously margined, as also the large bracts. — From Colorado to the sources of the Missouri and westward to Oregon.

Var. **minor,** Hook. & Arn. With shorter leaves, bracts, and sepals; the last two membranaceous. — W. Wyoming, *Parry.*

6. **A. Fendleri,** Gray. *Stems numerous from a perennial caudex, glabrous below, more or less glandular-pubescent above, imbricately many-leaved at base: leaves long,* somewhat flattened, *serrulate-scabrous,* smooth except on the margins: *cymes strict and few-flowered:* sepals *acuminate,* with a broad scarious margin: *seeds papillose-scabrous.* — Pl. Fendl. 13. Montana, Colorado, and southward.

Var. **glabrescens,** Watson. *Nearly glabrous throughout:* sepals shorter, *acute: leaves short.* — Bot. King's Exp. 40. Colorado and westward to Nevada.

Var. **diffusa,** Porter. *Branches of the cyme elongated, lax and widely spreading:* flowers numerous. — Fl. Colorado, 13. Ute Pass, Colorado, *Porter.*

§ 2. *The 3 valves of the capsule entire: seeds not appendaged at the hilum. Ours are all cespitose, not more than 3 inches in height, usually 1 to few-flowered, and with petals commonly exceeding the sepals.* — ALSINE.

7. **A. verna,** L. *Erect,* pubescent or glabrous: *leaves linear-subulate, nerved, erect:* cyme erect: *sepals orate, acute, mostly a little longer than the petals.* — Mountains of Colorado, Uintas, Teton Range, and northward to Arctic America.

Var. **hirta,** Watson. Leaves minutely hirsute, obtuse. — Bot. King's Exp. 41. With the last.

8. **A. biflora,** var. **carnosula,** Watson. *Stems creeping;* branches mostly 1-flowered: *leaves narrowly linear, nerveless: sepals linear, very obtuse, cucullate at the summit:* petals much longer than the sepals and capsule. — Bibl. Index, i. 94. *A. alpina* of the Fl. Colorado. Colorado.

Var. **obtusa,** Watson. *Leaves obtuse, carinate, serrulate-ciliate, obscurely 3-nerved: peduncles glandular-pubescent:* petals about half longer than the oblong sepals. — Watson, l. c. *A. arctica* of Hayd. Rep. for 1870–72, and *A. arctica,* var. *obtusa,* of Bot. King's Exp. and Fl. Colorado. Abundant in the mountains of Colorado, the Uintas, about Yellowstone Lake, and northward throughout the Arctic regions.

9. **A. stricta,** Watson. *Leaves subulate-triquetrous,* rather obtuse, *scarcely equalling the flower or exceeding the calyx,* mostly shorter than the internodes, *with manifest lateral nerves:* peduncles 1-flowered: petals sometimes wanting. — Watson, l. c. *Alsine stricta,* Wahl. *A. Rossii* of Hayd. Rep. 1870 and Fl. Colorado. *A. stricta,* Michx., of the Eastern Flora, becomes *A. Michauxii,* Hook. Colorado, Wyoming, and northward.

§ 3. *Parts of the flower sometimes in fours: valves of the capsule bifid: young ovary 3-celled: seed appendaged at the hilum with a small caruncle.* — MŒHRINGIA.

10. **A. lateriflora,** L. Sparingly branched, erect, minutely pubescent: *leaves oval or oblong, obtuse:* peduncles usually 2-flowered, soon becoming lateral: sepals oblong, *obtuse: petals exserted.* — From Colorado to Alaska, and eastward across the continent.

11. **A. macrophylla,** Hook. Stems ascending, mostly simple, puberulent above: leaves 3 to 4 pairs, *narrowly lanceolate, acute at each end,* bright green: flowers few on slender pedicels: sepals ovate-oblong, *acuminate: petals included.* — From the Bitter Root Mountains to Washington Territory and California; also in New Mexico.

6. SAGINA, L. PEARLWORT.

Low green herbs, with subulate or filiform glabrous leaves, and small terminal usually long-pedicelled flowers.

1. **S. decumbens,** Torr. & Gray. Stems decumbent, ascending: *leaves somewhat secund,* mucronate: *peduncles much longer than the leaves: petals as long as the sepals:* stamens 5 to 10. — Including *S. subulata,* Torr. & Gray, of Gray's Manual, where the species is credited to Wimmer. Rocky Mountains and eastward.

2. **S. Linnæi,** Presl. *Densely matted and decumbent, an inch or two high: leaves somewhat fascicled,* pungent: *flowers on long pedicels, at length nodding: sepals exceeding the petals:* stamens 10. — *Spergula saginoides,* L. From New Mexico to Arctic America.

3. **S. nivalis,** Lindb. *Cespitose, stems very short, scarcely ½ inch high:* leaves mucronate: *peduncles short, strict:* sepals with membranous margins, *scarcely equalling the petals.* — Uinta Mountains, *Watson.*

† Order 12. **PORTULACACEÆ.** (Purslane Family.)

More or less succulent herbs, with simple and entire leaves (either opposite or alternate) and regular but unsymmetrical perfect flowers; sepals (except in *Lewisia*) 2; petals 2 to 5 or more; stamens opposite the petals or numerous; ovary one-celled, in fruit becoming capsular; style 2 to 8-cleft; stipules none or scarious or reduced to hairs. Flowers open only in sunshine or bright daylight.

* Sepals 2, united below and adherent to the ovary, the free upper portion at length deciduous.

1. **Portulaca.** Stamens 7 to 20. Flowers solitary, yellow (in ours). Capsule opening by a lid.

* * Sepals 2, distinct, persistent (deciduous in *Talinum*): ovary free.

+ Style 3-cleft: capsule 3-valved: sepals equal.

2. **Talinum.** Stamens 10 to 30. Petals 5. Seeds numerous.
3. **Calandrinia.** Stamens more than 5. Petals 5 or more. Seeds mostly smooth and shining.
4. **Claytonia.** Stamens 5. Petals 5. Seeds smooth and shining.

+ + Style 2-cleft: capsule 2-valved: sepals unequal, hyaline.

5. **Spraguea.** Stamens 3. Petals 4. Stems simple, scape-like.
6. **Calyptridium.** Stamen 1. Petals 2. Stems branching, leafy.

* * * Sepals 4 to 8, distinct, much imbricated.

7. **Lewisia.** Stamens many. Style 3- to 8-cleft. Petals 8 to 16. Scapes 1-flowered.

1. PORTULACA, Tourn. Purslane.

Petals 4 to 6. Style deeply 3- to 8-cleft. — Fleshy diffuse or ascending annuals, with axillary or terminal ephemeral yellow (in ours) flowers.

1. **P. retusa,**[1] Engelm. Stems somewhat ascending, sometimes covering a space several feet in diameter: leaves flat, obovate to spatulate: sepals obtuse, broadly carinate-winged: seeds tuberculate. — S. W. Colorado and southward.

2. TALINUM, Adans.

Distinguished from *Calandrinia* by the deciduous sepals, the style less deeply 3-cleft, the capsule 3-celled at base when young, and the seeds on a globular stalked placenta.

1. **T. teretifolium,** Pursh. Leafy stems low, tuberous at the base: leaves linear, cylindrical: peduncle long and naked, bearing an open cyme of pink flowers. — In the mountains of Colorado and eastward.

3. CALANDRINIA, HBK.

Low succulent herbs, with radical leaves (in ours) and white to reddish ephemeral flowers in bracteate racemes or panicles, or few upon short scape-like stems.

[1] *P. oleracea*, L., is prostrate, not so green, with larger leaves, acute sepals, and seeds more finely tuberculate. — Common Purslane or Pig-weed; naturalized near dwellings.

1. **C. pygmæa,** Gray. Smooth, with a thick fusiform root: leaves linear, with broad scariously winged underground petioles: scapes mostly simple, *an inch or two high, with a pair of small scarious bracts: sepals glandular-dentate: petals red.* — Proc. Am. Acad. viii. 623. *Talinum pygmæum*, Gray. Alpine region, Rocky Mountains of Colorado and Wyoming to the Sierra Nevada in California and Cascade Mountains in Washington Territory.

2. **C. Nevadensis,** Gray. Very similar, but *somewhat larger;* with a pair of *larger leafy bracts* and *entire* somewhat longer *sepals, white petals* and more numerous ovules. — In the Wahsatch (*Watson*), probably in the Uintas, and westward.

4. CLAYTONIA, L. Spring-Beauty.

Seeds few, black and shining. — Low glabrous succulent herbs, with opposite or alternate leaves, and white or rose-colored flowers in loose terminal or axillary and simple or compound naked racemes, or sometimes umbellate, not ephemeral.

* *Annuals, with fibrous roots.*

+ *Stems simple, bearing a single pair of leaves which are often connate.*

1. **C. perfoliata,** Donn. Radical leaves long-petioled, *broadly rhomboidal or deltoid or deltoid-cordate, obtuse; the cauline pair more or less united, usually forming a single somewhat orbicular perfoliate leaf,* concave above: racemes usually nearly sessile and loosely flowered, the short pedicels often secund. — From the Uintas and the Wahsatch to California, and thence northward to Alaska.

2. **C. cordifolia,** Watson. Stem from a slender running rootstock: *radical leaves broadly cordate, acutish; cauline pair sessile, ovate, acute:* racemes few-flowered, with slender pedicels: *petals thrice longer than the rounded sepals.* — Proc. Am. Acad. xvii. 365. N. W. Montana (*Watson*), to Idaho and Oregon.

+ + *Stems usually branching, leafy.*

3. **C. Chamissonis,** Esch. Stems weak and slender, erect or decumbent, stoloniferous and rooting at the joints: leaves opposite, oblanceolate or spatulate: racemes few-flowered; the flowers very variable in size, on slender pedicels: petals white. — *C. aquatica*, Nutt. Abundant in Colorado and northward to the British boundary and westward. In the spray of the Lower Falls of the Yellowstone.

* * *Perennials, from a deep-seated tuber.*

4. **C. Caroliniana,** Michx. Radical leaves very few, spatulate; cauline ones a single pair, ovate-lanceolate or oval, subspatulate at the base or abruptly decurrent into a petiole: pedicels slender, nodding: flowers in a loose raceme: sepals and petals very obtuse, the latter pale rose-color with deeper veins. — In the Rocky Mountains and eastward to the Atlantic.

Var. **sessilifolia,** Torr. Radical leaf narrow; cauline sessile, lanceolate to linear: raceme nearly sessile and cymose, with a single scarious bract at base: sepals acutish. — *C. Caroliniana*, var. *lanceolata*, of Bot. King's Exp., Fl. Colorado, and the Hayden Reports. Colorado and northward, and westward to the Sierra Nevada.

* * * *Perennial, with a thickened candex.*

5. **C. megarrhiza,** Parry. Root fusiform, very large: leaves fleshy; radical ones petioled; cauline lanceolate or linear-lanceolate, sessile: racemes secund: flowers large, profuse, white with pinkish veins: petals obovate, subemarginate. — Parry in Herb. Gray. *C. arctica,* var. *megarrhiza,* of Bot. King's Exp. and Fl. Colorado. High alpine, growing in crevices of the rock, its large purple tap-root penetrating to a great depth. Mountains of Colorado and the Uintas.

5. SPRAGUEA, Torr.

Sepals orbicular-cordate. — A glabrous biennial; with mostly radical fleshy leaves and ephemeral flowers in dense scorpioid spikes umbellate-clustered on a scape-like peduncle.

1. **S. umbellata,** Torr. Stems several from a thickened root, 2 to 12 inches high: radical leaves spatulate or oblanceolate, on thick petioles; the cauline similar but smaller, frequently scariously stipulate: an involucre of scarious bracts subtending the dense capitate umbel of nearly sessile spikes: flowers light rose-color: sepals very conspicuous, about equalling the petals. — Wyoming (*Parry*), Yellowstone Park (*Coulter*), and westward. Usually in dry rocky or sandy localities.

6 CALYPTRIDIUM, Nutt.

Sepals broadly ovate or orbicular. Petals somewhat coherent at the apex. — Smooth prostrate diffusely branched annuals; with alternate succulent leaves and small ephemeral flowers in axillary or terminal, clustered or compound, scorpioid spikes.

1. **C. roseum,** Watson. Leaves oblong-spatulate, attenuate at base; radical leaves few or none: petals minute: capsule not exceeding the calyx. — Bot. King's Exp. 44, t. 6. W. Wyoming (*Parry*) and westward to California.

7. LEWISIA, Pursh.

Sepals broadly ovate, unequal, persistent. Petals large and showy. Style parted nearly to the base. — Low acaulescent fleshy perennials, cespitose, with thick fusiform roots.

1. **L. rediviva,** Pursh. Leaves densely clustered, linear-oblong, subterete, smooth and glaucous: scapes but little longer, jointed at the middle, and with 5 to 7 subulate scarious bracts verticillate at the joint: petals rose-colored or white. — Arizona, Utah, Wyoming, Montana (in the Bitter Root Mountains), and westward. The specific name refers to the fact that the roots are wonderfully tenacious of life.

Order 13. ELATINACEÆ. (Water-wort Family.)

Low annuals, with membranous stipules between the opposite dotless leaves, regular and mostly symmetrical flowers (2 to 5-merous), with

free sepals, hypogynous petals and stamens, and distinct styles bearing capitate stigmas, the ovary 2 to 5-celled with axile placenta becoming capsular in fruit.

1. ELATINE, L. Water-wort.

Parts of the flower in twos, threes, or fours. Sepals membranaceous, obtuse. Ovary globose. — Small prostrate glabrous plants, growing in water or wet places, with entire leaves and usually solitary flowers. Gray, Proc. Am. Acad. xiii. 361.

1. **E. triandra,** Schkuhr. *Leaves oblanceolate or oblong-lanceolate,* gradually attenuate at base: *petals, stamens, and carpels most frequently* 3, with 2 sepals: almost the seeds of the next, or more slender, less marked. — On the Platte River, in Nebraska or Colorado (*Hall*); also in Illinois.

2. **E. Americana,** Arn. *Leaves obovate, very obtuse: flowers with their parts oftener in twos,* sometimes in threes: seeds cylindraceous, somewhat curved, the crustaceous coat many- (20 to 30-) latticed in 9 to 10 lines. — Colorado and Oregon, also on the Atlantic border.

Order 14. HYPERICACEÆ. (St. John's-wort Family.)

Herbs (in ours), with opposite entire leaves punctate with translucent or dark-colored glandular dots, no stipules, and perfect flowers with 5 petals and numerous stamens, the fruit a many-seeded capsule. — Sepals 5, imbricate. Petals convolute, glandular-punctate. Stamens very numerous in 3 bundles. Styles 2 to 5.

1. HYPERICUM, L. St. John's-wort.

In our species the capsule is 3-celled by the union of the placenta with the axis, septicidal, and the flowers yellow with black dots.

1. **H. Scouleri,** Hook. Stems erect from a running rootstock, simple or sparingly branched: leaves ovate to oblong, clasping: flowers in an open cyme: styles elongated. — Colorado, Utah, southward and westward.

Order 15. MALVACEÆ. (Mallow Family.)

Mostly herbs, with mucilaginous juice, and alternate leaves with stipules; distinguished by the valvate calyx, convolute petals, their bases or short claws united with each other and with the base of a column of numerous monadelphous stamens, these with reniform 1-celled anthers. — Calyx 5-parted, often surrounded by an involucel. Petals 5. Pistils a ring of ovaries around a projection of the receptacle. Leaves most commonly palmately ribbed. Peduncles axillary. Flowers often large and showy. In all of ours the stamineal tube is anther-bearing at the top.

* Styles stigmatic down the inner side : carpels indehiscent : ovules solitary, ascending.[1]

1. **Callirrhoë.** Bractlets 3, or none. Petals truncate. Carpels beaked.
2. **Sidalcea.** Bractlets none. Filaments in a double series, those of the outer series united in 5 clusters. Carpels fewer, beakless.

* * Stigmas capitate : carpels mostly dehiscent at least at the apex.

3. **Malvastrum.** Bractlets 1 to 3. Ovule solitary, ascending.
4. **Sphæralcea.** Bractlets 1 to 3. Ovules 2, the lower ascending, the upper pendulous.
5. **Abutilon.** Bractlets none. Ovules 3 or more in each cell.

1. CALLIRRHOË, Nutt.

Petals wedge-shaped (usually red-purple). Carpels 10 to 20, with a short empty beak, separated within from the 1-seeded cell by a narrow projection.

1. **C. involucrata,** Gray. Hirsute: stem branching, procumbent: leaves *deeply* 3 *to* 5-*parted,* covered with stellate hairs, segments linear-lanceolate, laciniately 3 to 5-toothed: peduncles erect, 1-flowered, longer than the leaves: *flowers few in a loose panicle, scarlet: bractlets linear-lanceolate:* carpels hairy, *not wrinkled.* — Loup Fork of the Platte, S. E. Colorado, and southward.

2. **C. alcæoides,** Gray. Strigose-pubescent: stems slender: *lower leaves triangular heart-shaped, incised;* the upper 5 to 7-parted, laciniate; the uppermost divided into linear segments: *flowers corymbose, rose-color or white: involucel none:* carpels crested and *strongly wrinkled on the back.* — Valley of the Platte, southward and eastward to Kentucky and Tennessee.

2. SIDALCEA, Gray.

Carpels 5 to 9, beakless. — Herbs, with rounded and mostly lobed or parted leaves, the usually purple flowers in a narrow terminal raceme or spike.

1. **S. malvæflora,** Gray. Lower leaves 7 to 9-lobed; cauline more narrowly and deeply 5 to 7-lobed; *segments linear, somewhat toothed:* pedicels at first shorter, *at length longer than the subulate bracts: flowers purple or white: carpels* 7, *pointless.* — From Mexico to Colorado and Oregon.

2. **S. candida,** Gray. Lower leaves orbicular, 7-lobed, segments coarsely 3 to 5-toothed or incised; upper leaves 7-lobed or parted; *the segments lanceolate, entire: pedicels shorter than the bracts: flowers white or cream-color: carpels* 9 *or* 10, *cochleate-reniform, mucronate.* — On water-courses in the mountains of Colorado and southward.

3. MALVASTRUM, Gray. False Mallow.

Stamineal tube simple. Carpels 5 or more. — Herbaceous tufted perennials; the flowers in narrow naked or leafy subpaniculate racemes.

1. **M. coccineum,** Gray. *Low and hoary: leaves* 5-*parted or pedate:*

[1] *Malva,* an introduced genus, has 3 distinct bractlets, obcordate petals, and carpels rounded, beakless.

M. rotundifolia, L., has procumbent stems, round heart-shaped crenate obscurely-lobed leaves on very long petioles, whitish petals twice the length of the sepals, and pubescent carpels. — The common Mallow. Commonly naturalized along waysides and in cultivated ground.

spikes or racemes of *showy pink-red flowers.* — Common on the plains from Colorado to British America, and eastward to Iowa and Minnesota.

2. **M. Munroanum,** Gray. *Taller, grayish or hoary-pubescent: leaves broadly ovate, usually cordate at base,* 3 to 5-lobed or deeply cleft: *flowers scarlet.* — Utah, Montana, and westward.

4. SPHÆRALCEA, St. Hilaire.

Differing from *Malvastrum* only in the two-ovuled cells of the ovary.

1. **S. angustifolia,** Spach. Slender, erect, *hoary-pubescent: leaves oblong to narrowly lanceolate,* usually subcordate or rounded at base, crenate or coarsely toothed: flowers small. — S. Colorado and southward.

2. **S. rivularis,** Torr. *Taller, scabrous with a stellate pubescence: leaves cordate, deeply 5 to 7-lobed,* coarsely serrate: racemes leafy below, naked above; the flowers clustered on short peduncles, light purple or nearly white. — *S. acerifolia* of the Hayden Reports for 1870–72 and Bot. King's Exp. W. Wyoming, northward and westward.

5. ABUTILON, Tourn. Indian Mallow.

Herbs, usually soft-tomentose: flowers mostly axillary, yellow (in ours).

1. **A. parvulum,** Gray. Cinereous-tomentose: stems slender, spreading, paniculate above; branchlets pilose with spreading hairs: leaves small, cordate, dentate, sometimes 3-lobed, canescent, tomentose beneath: peduncles axillary, 1-flowered, longer than the leaf. — Ledges of rock near Cañon City, Colorado (*Greene*), and southward.

Order 16. LINACEÆ. (Flax Family.)

Herbs, with the regular and symmetrical hypogynous flowers 4 to 6- (5 in ours) merous throughout, strongly imbricated calyx and convolute petals, the stamens monadelphous at the base, and the pod 8 to 10-seeded, having twice as many cells as there are styles.

1. LINUM, L. Flax.

Styles often united into one below; ovary globose. Seeds flattened, ovate, the coat mucilaginous when wetted. — Herbs (sometimes shrubby at base) with tough fibres in the bark, sessile entire alternate leaves, no stipules, and cymose or panicled flowers.

* *Petals blue.*

1. **L. perenne,** L. Branching above, leafy: leaves linear to lanceolate, acute: flowers large, in few-flowered corymbs or scattered on the leafy branches: capsule exceeding the sepals, the prominent false partitions long-ciliate. — Common on dry soils throughout our whole range, thence northward and westward.

* * *Petals yellow: sepals glandular-margined.*

2. **L. rigidum,** Pursh. *Stems angled,* much branched: leaves linear, *pungently-acute,* rigid, with scabrous margins: *pedicels thickened at the end and*

forming an exterior cup-shaped calyculus: petals sulphur-yellow: *styles united almost to the top: capsule shorter than the sepals.* — From S. Colorado to the Missouri River.

3. **L. Kingii,** Watson. Stems panicled above, *shrubby at base:* leaves linear or narrowly oblong, *obtuse: styles distinct: capsule somewhat exceeding the sepals.* — Bot. King's Exp. 49. Mountains of Utah.

Order 17. ZYGOPHYLLACEÆ.

Distinguished from allied orders by the opposite compound leaves, with interposed stipules and entire dotless leaflets. — Sepals 5, distinct. Petals hypogynous, imbricated in the bud. Stamens (in ours) twice as many as the petals and inserted with them. Ovary 5 to 12-celled, with a single terminal style. Fruit dry. — Ours are herbs or shrubs, with solitary flowers on lateral or terminal naked peduncles, and ovary surrounded at the base by a disk.

1. **Tribulus.** Leaves abruptly pinnate, 6 to 16-foliolate. Fruit tuberculate. Herbs.
2. **Larrea.** Leaves 2-foliolate. Fruit densely hairy. Heavy-scented shrubs.

1. TRIBULUS, L.

Sepals mostly persistent. Petals fugacious. Disk annular, 10-lobed. Stamens 10, the alternate filaments a little shorter and with a gland at base on the outer side. Ovary 5 to 12-celled. Fruit lobed, separating into roughly tuberculate carpels. — Loosely branched and hairy prostrate herbs, with apparently axillary white or yellow flowers.

1. **T. maximus,** L. Leaflets ovate-oblong, more or less oblique: sepals very hairy, linear, acuminate: fruit beaked by a stout style. — *Kallstræmia maxima,* Torr. & Gray. Fremont County, Colorado (*Brandegee*), to S. California and Texas.

2. LARREA, Cav. Creosote-bush.

Sepals deciduous. Petals unguiculate. Disk 10-lobed. Filaments winged below with a bifid scale on the inner side. Ovary 5-celled. Fruit globose, shortly stipitate, separating into 5 hairy one-seeded carpels. — Evergreen heavy-scented shrubs, with nodose branches, and yellow flowers.

1. **L. Mexicana,** Moric. Diffusely branched, 4 to 10 feet high, densely leafy, of a yellowish hue: leaves nearly sessile; the thick resinous leaflets inequilateral, with a broad attachment to the rachis: sepals silky: scales a little shorter than the filament, somewhat lacerate: fruit beaked by a slender style. — S. Colorado to California and Texas.

Order 18. GERANIACEÆ. (Geranium Family.)

Leaves generally with stipules, either lobed or compound. Flowers on axillary peduncles, regular (in ours) and the parts in fives. Stamens mostly 10, often somewhat monadelphous. Ovary 5-celled, with a central axis.

Tribe I. Five glands of the receptacle alternate with the petals. Ovary deeply 5-lobed, the carpels separating elastically at maturity from the long-beaked and indurated central axis from below upward: the styles forming long tails which become revolute upwards or spirally twisted. — GERANIEÆ.

1. **Geranium.** Fertile stamens 10. Tails of the carpels not bearded.
2. **Erodium.** Fertile stamens 5. Tails of the carpels bearded inside.

Tribe II. No glands alternate with the petals. Ovary not lobed, becoming in fruit a 5-celled loculicidal capsule. Leaves compound, with entire leaflets. Juice sour. — OXALIDEÆ.

3. **Oxalis.** Leaves in ours 3-foliolate.

1. GERANIUM, L. CRANESBILL.

Annual or perennial herbs, with enlarged joints, palmately lobed and mostly opposite leaves, scarious stipules, and 1 to 3-flowered peduncles.

* *Annual or biennial: flowers small.*

1. **G. Carolinianum,** L. Decumbent or ascending, diffusely branched, pubescent: leaves palmately 5 to 7-parted, the divisions cleft into oblong-linear lobes: petals rose-color, equalling the awned sepals: carpels hairy. — Across the continent.

Var. **longipes,** Watson. Peduncles usually solitary, and, with the pedicels, much elongated. — Bot. King's Exp. 50. Colorado and southward.

* * *Perennial: flowers large.*

2. **G. Fremontii,** Torr. *Rather stout,* more or less pubescent throughout, *with a short, close, glandular pubescence, sparsely intermixed with longer, pilose hairs: upper leaves deeply 3 to 5-cleft; radical ones 7-cleft,* segments 3-lobed or incised: petals light or deep purple. — From Colorado to Wyoming and Idaho. Much that is called by this name is *G. cæspitosum,* James.

Var. **Parryi,** Engelm. Stems and peduncles plainly glandular-villose: *leaves less deeply cut, ultimate lobes or teeth ovate, somewhat obtuse.* — Gray's Peak, Colorado.

3. **G. Richardsoni,** Fisch. & Mey. *Taller but not so stout nor so hairy, with the pubescence usually fine and appressed,* or somewhat glandular and spreading upon the pedicels: leaves 5 *to 7-cleft* nearly to the base, *the broad lobes more or less incisely toothed:* petals purple or sometimes white. — In the mountains from New Mexico to British America and westward.

4. **G. incisum,** Nutt. Closely resembling the last, but *more villous and glandular-pubescent: leaves rather more narrowly and laciniately cut:* petals usually deep purple. — From California through Montana to the Saskatchewan.

5. **G. cæspitosum,** James. *More slender* and more diffusely branched: *radical leaves smaller, reniform, deeply 5 to 7-cleft,* pubescent: flowers purple. — New Mexico and northward. Includes many of the forms which have been called *G. Fremontii.*

2. ERODIUM, L'Her. STORKSBILL.

Sterile stamens scale-like. Tails of the carpels becoming spirally twisted. — Leaves pinnate, peduncles umbellately 4 to 8-flowered, with a 4-bracted involucre; petals small.

1. **E. cicutarium,** L'Her. Hairy, much branched from the base: leaflets laciniately pinnatifid with narrow acute lobes: peduncles exceeding the leaves: petals bright rose-color: pedicels at length reflexed, the fruit still erect. — E. Utah and throughout the whole region west of the Rocky Mountains. Known as "Alfilaria," "Pin-clover," and "Pin-grass."

3. OXALIS, L. Wood-Sorrel.

Low, often acaulescent, with obcordate leaflets and peduncles umbellately or cymosely few to many-flowered.

1. **O. violacea,** L. *Acaulescent, nearly smooth,* leaves and scapes from *a scaly bulb:* scapes longer than the leaves, umbellately flowered: *petals violet: capsule few-seeded.* — Colorado, and common eastward.

2. **O. corniculata,** L. *Caulescent, more or less villous,* from *running root-stocks:* stems sometimes 2 or 3 feet high: *petals yellow: capsule many-seeded.*

Var. **stricta,** Sav. *Without stipules.* — *O. stricta,* L. Colorado and eastward across the continent.

Order 19. RUTACEÆ. (Rue Family.)

Shrubs or small trees, with pellucid or glandular-dotted aromatic leaves, definite hypogynous stamens, and few seeds. — Sepals and petals 4 or 5, imbricated in the bud. Stamens as many or twice as many as the petals, inserted outside of a hypogynous disk. Stipules none.

1. **Ptelea.** Leaves 3-foliolate. Fruit orbicular, indehiscent, broadly winged. Stamens 4 or 5.
2. **Thamnosma.** Leaves simple, alternate. Fruit a 2-lobed coriaceous capsule. Stamens 8.

1. PTELEA, L. Shrubby Trefoil. Hop-tree.

Flowers polygamous. Ovary with a short thick stipe, 2-celled; cells 2-ovuled, the lower ovule abortive: style short. — Shrubs or small trees; flowers small, greenish-white, in terminal cymes or compound corymbs.

1. **P. angustifolia,** Benth. A shrub 5 to 25 feet high, with chestnut-colored punctate bark: leaflets oblong-lanceolate, entire, becoming smooth and shining with age: fruit emarginate at base and often above; the stipe narrow. — S. Colorado to California and Texas.

2. THAMNOSMA, Torr.

Disk cup-shaped, crenate or lobed. Ovary stipitate, 2-celled; cells 5 or 6-ovuled: style elongated. — Low glandular desert shrubs, strongly scented; leaves linear; flowers solitary.

1. **T. Texana,** Torr. Woody only at base, the slender stems 3 to 15 inches high: flowers on short naked pedicels: petals yellow tinged with purple. — *Rutosma Texanum,* Gray. S. W. Colorado and southward.

Order 20. CELASTRACEÆ. (Staff-tree Family.)

Shrubs, with simple leaves, no stipules, and small dull-colored perfect regular flowers, the stamens as many as the petals and inserted on the margin of a broad disk which lines the calyx-tube. — Sepals and petals imbricated. Stamens alternate with the petals. Seeds arillate.

1. PACHYSTIMA, Raf.

Calyx with a short tube and 4 rounded lobes. Petals 4. Ovary free, 2-celled: style very short. Capsule small, coriaceous, 1 to 2-seeded. Seeds enclosed in a white many-cleft membranaceous aril. — Low evergreen shrubs; leaves smooth, opposite, very shortly petioled, serrate or serrulate; flowers green, in one to few-flowered axillary cymes.

1. **P. Myrsinites,** Raf. Leaves ovate to oblong or oblanceolate, cuneate at base: fruit smooth. — In the mountains from New Mexico to British America and westward to California. In dense clumps on wooded slopes. The only other species known (*P. Canbyi*) grows at a single station in the Alleghany Mountains of Virginia.

Order 21. RHAMNACEÆ. (Buckthorn Family.)

Shrubs or small trees, with simple undivided leaves, small and often caducous stipules, and small regular flowers. — Sepals valvate in the bud; a conspicuous disk lining the short tube of the calyx. Petals clawed, mostly involute, each around a stamen in the bud, sometimes wanting. Stamens perigynous and alternate with the sepals. In ours the fruit is berry-like or dry, containing 2 to 4 separating seed-like nutlets, and the leaves are alternate.

1. **Rhamnus.** Calyx and disk free from the ovary; calyx-lobes erect or spreading. Petals small, short-clawed, or none. Filaments very short. Fruit berry-like, with 2 to 4 mostly indehiscent nutlets.
2. **Ceanothus.** Calyx and disk adnate to the base of the ovary; calyx-lobes connivent. Petals long-clawed, hooded. Filaments exserted. Fruit dry, with 3 dehiscent nutlets.

1. RHAMNUS, L. Buckthorn.

Flowers perfect or polygamo-diœcious. Calyx 4 to 5-cleft. Petals on the margin of the disk. — Leaves pinnately veined, with small deciduous stipules, and greenish flowers axillary cymose or racemose.

§ 1. *Seeds and nutlets deeply sulcate or concave on the back: flowers mostly diœcious, solitary or fascicled in the axils.* — Rhamnus proper.

1. **R. alnifolia,** L'Her. A shrub 2 to 4 feet high: leaves deciduous, ovate-oblong, crenately serrate: petals wanting: fruit black, obovate, 3-lobed. — W. Wyoming, westward, and eastward across the continent.

§ 2. *Seeds and nutlets convex on the back: flowers mostly perfect, in pedunculate cymes.* — FRANGULA.

2. **R. Caroliniana,** Walter. Thornless shrub or small tree: *leaves oblong, obscurely serrulate, deciduous: flowers in one form umbelled, in another solitary in the axils:* fruit globose, 3-seeded. — *Frangula Caroliniana,* Gray. From the mountains eastward across the continent.

3. **R. Californica,** Esch. A spreading shrub, with the young branches somewhat tomentose: *leaves ovate-oblong to elliptical, denticulate or nearly entire, evergreen: peduncles with numerous mostly abortive flowers in subumbellate fascicles:* fruit blackish purple with thin pulp, 2 to 3-lobed and 2 to 3-seeded. — *Frangula Californica,* Gray. S. W. Colorado to California.

4. **R. Purshiana,** DC. Sometimes 20 feet high; young branches tomentose: *leaves elliptic, denticulate, deciduous, somewhat pubescent beneath: flowers rather large, in a somewhat umbellate cyme:* fruit black, broadly obovoid, 3-lobed and 3-seeded. — N. Idaho and westward in the Pacific States.

2. CEANOTHUS, L. New Jersey Tea.

Flowers perfect. Calyx 5-cleft. — Shrubs or small trees, sometimes spinescent, with petioled leaves and showy thyrsoid or cymose white (in ours) flowers. — Watson, Proc. Am. Acad. x. 333. Ours all belong to the first section of the genus, in which the leaves are all alternate and 3-nerved, glandular-toothed or entire, and the fruit not crested.

* *Branches not spiny: inflorescence thyrsoid: leaves usually large, glandular-serrate.*

1. **C. velutinus,** Dougl. A shrub 2 to 3 feet high, usually glabrous: leaves thick, *broadly ovate or elliptical, resinous and shining above, sometimes velvety beneath:* flowers in a loose thyrse: *peduncles usually short.* — Colorado, Utah, and northwestward.

Var. **lævigatus,** Torr. & Gray. *Leaves mostly glabrous beneath.* — More common than the type; ranging from Colorado northwestward to the British boundary.

2. **C. ovatus,** Desf. A shrub 2 to 3 feet high: *leaves narrowly oblong or elliptical-lanceolate, glandular-serrulate,* nearly glabrous: thyrse umbel-like, *the pedicels elongated and closely approximated.* — Includes *C. ovalis,* Bigel. Colorado and Wyoming.

3. **C. sanguineus,** Pursh. *A shrub 4 to 12 feet high:* stem and branches *reddish: leaves broadly ovate or obovate, subcordate, serrate:* thyrsoid corymbs in lateral panicles, *on very short peduncles.* — Includes *C. Oreganus,* Nutt. Along the Missouri and its tributaries.

* * *Branches mostly spinose, grayish: flowers in simple clusters: leaves small, entire.*

4. **C. Fendleri,** Gray. A shrub one or two feet high, widely and intricately branched: leaves oval or elliptic, silky-canescent beneath, smoothish and green above: flowers in clusters, dense, sessile, glabrous. — Colorado and southward.

Order 22. **VITACEÆ.** (Vine Family.)

Woody plants, mostly climbing by tendrils, branchlets articulated and often thickened at the nodes, usually palmately veined or lobed or compound alternate leaves, panicled cymose or thyrsoid inflorescence, small greenish or whitish flowers, and fruit a berry. — Flowers very commonly polygamous or diœcious. Calyx minute, truncate, or 4 to 5-toothed, caducous or early deciduous. Petals 4 or 5, valvate. Stamens the same number and opposite. Ovules in pairs or solitary in the cells of the ovary.

1. **Vitis.** Calyx filled with an adnate fleshy disk which bears the petals and stamens. Leaves simple.
2. **Ampelopsis.** Disk none. Leaves palmately compound.

1. VITIS, Tourn. Grape.

Petals thick and caducous. Stamens distinct. Ovary 2-celled, with a pair of ovules in each cell. — Tendrils and flower-clusters opposite the leaves, the former almost always at least once forked.

1. **V. riparia,** Michx. Leaves usually incisely 3-lobed, the lobes long-pointed: panicles small, rather simple: berries mostly with bloom: seeds obtuse or somewhat obcordate and with an inconspicuous rhaphe. — *V. cordifolia,* var. *riparia,* Gray. Colorado; common in the Atlantic States.

2. AMPELOPSIS, Michx. Virginia Creeper.

Calyx slightly 5-toothed. Petals concave, thick, expanding before the fall. — Leaves with 5 oblong-lanceolate sparingly serrate leaflets. Tendrils fixing themselves to trunks or walls by dilated sucker-like disks at their tips.

1. **A. quinquefolia,** Michx. A woody vine in low rich grounds, climbing extensively, sometimes by rootlets as well as by its disk-bearing tendrils: berries small and blackish. — Colorado (*Meehan*), and throughout the Atlantic and Mississippi Valley States. Leaves turning bright crimson in autumn.

Order 23. **SAPINDACEÆ.** (Soapberry Family.)

Ours are all trees of the Maple Family, which has compound or lobed opposite leaves without stipules, polygamous or diœcious regular flowers, sometimes without petals, each cell of the 2-celled fruit producing a wing and becoming a samara.

1. **Acer.** Leaves palmately lobed or rarely divided. Flowers polygamous.
2. **Negundo.** Leaves pinnate. Flowers diœcious, apetalous.

1. ACER, Tourn. Maple.

Calyx colored, usually 5-lobed. Petals as many or none. Stamens 3 to 12, usually 8, inserted with the petals upon a lobed disk. Fruit divaricately 2-winged above, separable at maturity, each 1-seeded. — Flowers in umbel-like corymbs or fascicles.

1. **A. grandidentatum,** Nutt. *Leaves cordate or truncate at base,* rather deeply 3-lobed, with broad round sinuses; lobes rather acute, *coarsely sinuate-dentate:* the umbel-like corymb *nearly sessile,* few-flowered, the pedicels long and nodding. — Utah and northward along the western slopes of the mountains. Rarely attains a foot in diameter and 30 to 40 feet in height.

2. **A. glabrum,** Torr. *Shrub 6 to 10 feet high: leaves subreniform, orbicular in outline,* 3-lobed or more usually 3-parted; segments short and broad, *acutely incised and toothed, somewhat 3-lobed, middle one cuneate:* the umbel-like corymb *pedunculate:* sepals about 8. — Includes *A. tripartitum,* Nutt. From New Mexico to Wyoming and westward. Along water-courses among the mountains.

2. NEGUNDO, Mœnch. Box-Elder.

Petals and disk none. Fruit as in *Acer.* — Sterile flowers on clustered capillary pedicels, the fertile in drooping racemes.

1. **N. aceroides,** Mœnch. Leaflets very veiny, ovate, pointed, toothed: fruit smooth, with large rather incurved wings. — In the valleys from New Mexico northward. A tree with light green twigs and delicate drooping clusters of greenish flowers a little earlier than the leaves.

Order 24. ANACARDIACEÆ. (Cashew Family.)

Shrubs or trees with a resinous juice, alternate leaves without stipules, and small regular flowers commonly polygamous or dicœcious. Stamens as many or twice as many as the petals. The free ovary 1-celled and 1-ovuled, but the styles often 3. Fruit a dry drupe.

1. RHUS, L. Sumach.

Sepals and petals usually 5. Stamens inserted under the edge of a disk lining the base of the calyx. — Leaves simple or pinnate.

* *Leaflets 11 to 31: flowers in a terminal thyrsoid panicle.*

1. **R glabra,** L. Shrub 2 to 12 feet high: leaflets whitened beneath, lanceolate-oblong, pointed, serrate: fruit globular, clothed with acid crimson hairs; the stone smooth. — Colorado, Utah, Idaho, and eastward across the continent. Not poisonous.

* * *Leaflets 3.*

2. **R. Toxicodendron,** L. *Climbing by rootlets* over rocks or ascending trees: leaflets rhombic-ovate, rather downy beneath, variously notched, sinuate, or cut-lobed: *flowers in loose and slender axillary panicles: fruit globular, glabrous,* whitish or dun-colored; the stone striate. — Colorado, Utah, Wyoming, and eastward. Poisonous to the touch.

3. **R. aromatica,** Ait., var. **trilobata,** Gray. *A shrub 2 to 5 feet high,* diffusely branched, strongly scented: leaflets cuneate-obovate or rhomboidal, coarsely toothed above and often 3-lobed: *flowers in clustered scaly bracted spikes* like catkins, preceding the leaves, yellowish: *fruit flattish, somewhat viscid.* — *R. trilobata,* Nutt. Common throughout the Rocky Mountains to the Upper Missouri, and westward.

Order 25. LEGUMINOSÆ. (Pulse Family.)

Plants with irregular or sometimes regular flowers, mostly 10 monadelphous or diadelphous stamens, and a single simple free pistil becoming a legume in fruit. — Leaves alternate, with stipules, usually compound.

Suborder I. PAPILIONACEÆ.

Flower irregular. Calyx mostly 5-cleft or 5-toothed. Corolla of 5 petals (rarely fewer); one (standard) superior, larger and always external, covering in the bud the two lateral ones (wings), and these covering the inferior pair, which together form the keel, this in turn enclosing the stamens and pistil. Style generally inflexed or incurved.

* Stamens distinct.

+ Leaves digitately 3-foliolate.

1. **Thermopsis.** Stipules conspicuous, and yellow flowers in racemes.

+ + Leaves unequally pinnate.

2 **Sophora.** Pod thick, large, several-seeded, often transversely constricted. Leaves coriaceous.

9. **Amorpha.** Pod small, 1 to 2-seeded. Petal one. Stamens monadelphous at the very base.

* * Stamens monadelphous or diadelphous (9 and 1).

+ Anthers of two forms: filaments strictly monadelphous: leaves digitate, of more than 3 entire leaflets.

3. **Lupinus.** Calyx 2-lipped. Standard with recurved sides: keel falcate. Pod large, straight.

+ + Anthers reniform.

++ Leaflets 3 (rarely 5 to 7), denticulate or serrulate: stamens diadelphous or nearly so: pods small and enclosed in the calyx.[1]

4. **Trifolium.** Flowers capitate. Corolla persistent, united with the filaments.

++ ++ Leaves unequally pinnate (very rarely digitate or simple); leaflets entire: no tendril.

= Flowers in axillary umbels or solitary: stamens diadelphous.

5. **Hosackia.** Corolla yellow or partly white or turning reddish: claw of the standard usually remote from the others Pod linear, several-seeded.

= = Flowers in spikes, racemes, or heads, never umbellate.

a. Herbage glandular-dotted: stamens mostly monadelphous: pod usually indehiscent.

6. **Psoralea.** Herbs, with 3 to 7-foliolate leaves and axillary spikes or racemes. Pod one-ovuled, one-seeded.

[1] *Medicago* is an introduced genus, with small flowers in axillary racemes or spikes, petals free and deciduous, and the pod spirally coiled or curved. See foot-note, p. 54.

7. **Dalea.** Shrubby or herbaceous, with pinnate or palmate leaves and terminal spikes or heads. Wings and keel inserted on and articulated with the stamen tube. Pod 2 to 6-ovuled, mostly one-seeded.

8. **Petalostemon.** Herbs, with odd-pinnate leaves and terminal spikes or heads. Stamens 5; the cleft tube of filaments bearing 4 of the petals on its summit. Pod 1 to 2-seeded.

9. **Amorpha.** Shrubs, with pinnate leaves and terminal racemes or spikes. Wings and keel of the corolla wanting. Stamens monadelphous only at base, otherwise distinct. Pod 1 to 2-ovuled, 1 to 2-seeded.

b. Shrubs or shrubby: herbage not glandular: leaves pinnate: pod flat, 2-valved: stamens diadelphous.

10. **Peteria.** Racemes terminal or opposite the leaves. Pod narrow, many-seeded. Leaflets not stipellate.

11. **Robinia.** Pod thin, margined on one edge. Leaflets stipellate.

c. Herbage glandular or glutinous and more or less punctate: leaves unequally pinnate: stamens diadelphous; anthers confluently one-celled.

12. **Glycyrrhiza.** Flowers, etc. of *Astragalus.* Pod prickly or muricate, short, one-celled.

d. Herbage neither glandular nor dotted: stamens diadelphous; anthers 2-celled: leaves pinnate.

13. **Astragalus.** Pods mostly bladdery or turgid, or more or less 2-celled by intrusion of the dorsal suture. Keel not tipped with a point or sharp appendage.

14. **Oxytropis.** Keel tipped with a point; otherwise as in *Astragalus.*

++ ++ ++ Herbs with odd-pinnate leaves and no tendril: pod transversely 2 to several-jointed, the reticulated one-seeded joints indehiscent.

15. **Hedysarum.** Stamens diadelphous (5 and 1).

++ ++ ++ ++ Leaves abruptly pinnate, terminated by a tendril or bristle: stamens diadelphous: peduncles axillary: pod 2-valved.

16. **Vicia.** Stamen-tube oblique at the summit. Style filiform, hairy around and below the apex.

17. **Lathyrus.** Stamen-tube nearly truncate. Style dorsally flattened toward the apex, hairy on the inner side, usually twisted half round.

Suborder II. CÆSALPINIÆ.

Flower more or less irregular. Perigynous disk lining the tube or base of the calyx. Petals imbricated in the bud, the one corresponding to the standard within the lateral ones. Stamens 10 or fewer, distinct. — In ours the corolla is yellow and not at all papilionaceous.

18. **Cassia.** Leaves simply and abruptly pinnate. Anthers either 10 and unequal, or some of the upper ones imperfect, abortive, or wanting.

19. **Hoffmanseggia.** Leaves abruptly or unequally bipinnate, and dotted with black glands. Stamens 10, with anthers all perfect and filaments hairy. Racemes opposite the leaves.

Suborder III. MIMOSEÆ.

Flowers regular, small, and numerous in spikes or heads. No disk. Calyx and corolla valvate in the bud. Stamens as many or twice as many as the petals, hypogynous. Leaves usually twice pinnate.

20. **Schrankia.** Petals united below into a cup. Pod covered with small prickles or rough projections.

1. THERMOPSIS, R. Br.

Calyx campanulate, cleft to the middle. Standard shorter than the oblong wings, the sides reflexed: keel nearly straight, equalling the wings. Pod linear to oblong-linear, much compressed, shortly stipitate or nearly sessile, straight or incurved. — Stout perennial herbs with erect clustered stems; stipules free, leaflets entire.

1. **T. rhombifolia,** Richardson. Stems angular, nearly smooth: *stipules as long as the petioles;* leaflets *obovate-cuneiform, silky-puberulent,* at length nearly glabrous: bracts oval: *pod alcate, recurved or pendulous, glabrous,* 10 to 14-seeded. — From Colorado northward, at the head-waters of the Platte, Missouri, and Saskatchewan.

2. **T. montana,** Nutt. Somewhat silky-pubescent, at length glabrous: *stipules exceeding the petioles;* leaflets *oblong-obovate to oblong, sparingly villous beneath, smooth above:* bracts mostly lanceolate: *pod straight, erect, pubescent,* 10 to 12-seeded. — Torr. & Gray, Fl. i. 388. *T. fabacea* of Hayd. Rep. 1872. *T. fabacea,* var. *montana,* of Bot. King's Exp., Hayd. Rep. 1870 and 1871, and Fl. Colorado. From New Mexico to Washington Territory and eastward to the borders of Nebraska and Dakota.

2. SOPHORA, L.

Calyx-tube campanulate; teeth short. Petals nearly equal; standard broad. Pod stipitate, terete or somewhat compressed. — Ours are herbs; leaves with numerous entire leaflets; stipules small or obsolete; flowers white, in terminal racemes.

1. **S. sericea,** Nutt. Low, 6 to 12 inches high, more or less silky-canescent: leaflets about 21, elliptic or cuneate-oval: racemes short, at first scarce exserted beyond the leaves: calyx gibbous at base. — High plains of Colorado and northward along the plains of the Platte and the Missouri.

3. LUPINUS, L. Lupine.

Wings united above, enclosing the keel. Stigma bearded. Pod 2-valved, compressed, coriaceous. — Generally herbaceous; stipules adnate to the petioles. Flowers in terminal racemes, verticillate, or scattered, bracteate.

§ 1. *Ovules several: cotyledons petioled in germination.* — Lupinus proper. *Ours are all herbaceous perennials, with oblong pods.*

* *Dwarf and cespitose: racemes usually short and dense: pods 3 to 4-seeded.*

1. **L. cæspitosus,** Nutt. Nearly stemless, silky-hirsute: *raceme sessile, shorter than the leaves;* bracts setaceous, deciduous: petals pale blue. — Torr. & Gray, Fl. i. 379. From the mountains of W. Colorado and Utah northward to the head-waters of Snake and Yellowstone Rivers.

2 **L. aridus,** Dougl. Pubescence villous, both loose and appressed: leaflets oblanceolate: *peduncles shorter than the leaves: bracts nearly equalling the calyx:* petals purple; the standard elliptical. — Sources of the Missouri, to Washington, Oregon, and California. In low valleys.

3. **L. minimus,** Dougl. Appressed silky-villous: leaflets obovate or oblanceolate: *peduncles equalling or exceeding the leaves;* bracts linear: petals

purple; *the standard orbicular.* — From N. W. Wyoming to Washington Territory and California.

4. **L. Lyallii,** Gray. *Stems from a spreading woody caudex:* pubescence dense, villous, appressed: leaflets obovate: *racemes very short, the peduncles much exceeding the leaves:* bracts short: petals purple; the standard elliptical. — Proc. Am. Acad. vi. 334. Bitter Root Mountains, and in the Cascades of Washington Territory.

* * *Stems taller, erect or ascending, and racemes elongated.*

+– *Flowers large: leaflets* 7 *to* 10, *glabrous above or nearly so: ovules* 5 *to* 8.

5. **L. Burkei,** Watson. *Stout, erect, the short and silky pubescence closely appressed:* lower leaves long-petioled; leaflets about equalling the petioles: *raceme usually short and dense;* bracts villous: flowers purple or sometimes white: *calyx with spreading pubescence: keel nearly semicircular: pod* 8*-seeded.* — Proc. Am. Acad. viii. 525. *L. polyphyllus,* of Bot. King's Exp. and Hayd. Rep. 1871 and 1872. Head-waters of Yellowstone and Snake Rivers, to N. Nevada.

6. **L. Sitgreavesii,** Watson. *Puberulent and somewhat silky villous with spreading hairs:* raceme open, shortly peduncled: *calyx appressed-silky:* standard rounded, naked: *ovules* 5. — Proc. Am. Acad. viii. 527. In the mountains from the S. Sierra Nevada to S. Colorado and New Mexico.

7. **L. Plattensis,** Watson. *Appressed silky-villous throughout, with a somewhat glaucous hue:* leaflets spatulate: raceme loose, shortly peduncled: petals pale blue, *with a conspicuous darker spot upon the standard.* — Proc. Am. Acad. xvii. 369. *L. ornatus,* Dougl., var. *glabratus,* Watson. The *L. ornatus* of the Hayden Reports. Common on the Upper Platte and northward.

+– +– *Flowers smaller* (3 *to* 5 *lines long*): *ovules* 2 *to* 6.

++ *Lower petioles elongated: leaflets not glabrous above: racemes mostly dense.*

8. **L. leucophyllus,** Dougl. Leafy, densely silky-tomentose throughout and somewhat villous: leaflets 7 to 10, oblanceolate or cuneate-oblong; the upper petioles about equalling the leaves: racemes sessile or nearly so, densely flowered: pedicels stout: petals blue or pink; the standard densely villous. — Head-waters of the Platte and Missouri Rivers, to Washington Territory and N. California.

++ ++ *Stems slender: pubescence short, silky, appressed: petioles and peduncles mostly short: flowers subverticillate or scattered, on short slender pedicels.*

9. **L. parviflorus,** Nutt. Stems 2 or 3 feet high: *pubescence scanty,* the calyx and pedicels silky: *leaflets* 5 *to* 11, *oblanceolate to obovate, glabrous above, the lower leaves shorter than the petioles: standard naked.* — Mountains of Central Colorado, to the sources of Snake River, and westward to Central California and the Columbia River.

10. **L. laxiflorus,** Dougl. Stems 1 to 2 feet high: *leaflets* 6 *to* 8, *narrowly oblanceolate, silky on both sides, at least half as long as the petioles: calyx narrowed and saccate at base: standard somewhat pubescent.* — Wahsatch Mountains, westward to N. California and Vancouver Island.

11. **L. argenteus,** Pursh. Hoary with thick pubescence: stem 1 to 2 feet high: leaflets 5 to 8, *linear-lanceolate, smooth above or nearly so, about equalling the petioles: calyx gibbous but not spurred at base:* petals blue or cream-

colored; standard very broad. — From Central Colorado to Montana, and westward along the plains of Snake and Columbia Rivers.

Var. **decumbens,** Watson. Stem stouter and more leafy: raceme dense. — Proc. Am. Acad. viii. 532. *L. decumbens,* Torr. *L. laxiflorus,* of Hayd. Rep. 1872. *L. laxiflorus,* var. *tenellus,* of Hayd. Rep. 1871. From Montana and Wyoming southward into New Mexico and Arizona.

Var. **argophyllus,** Watson. More silky-pubescent; the leaflets *nearly equally so on both sides, longer than the petioles:* flowers larger: *calyx decidedly spurred.* — Proc. Am. Acad. viii. 532. S. Colorado and New Mexico.

§ 2. *Ovules* 2 (*rarely* 3 *or* 4): *cotyledons broad and clasping after germination, usually long persistent. Erect annuals: leaflets cuneate-oblong or -obovate: bracts persistent: pod ovate.* — PLATYCARPOS, Watson.

12. **L. pusillus,** Pursh. Rather stout, 3 to 10 inches high, *hirsute with long spreading hairs:* leaflets mostly 5, nearly smooth above, about half as long as the petioles: *racemes spicate, nearly sessile,* 2 *or* 3 *inches long:* petals purple or rose-color: pod very hirsute. — From the Upper Missouri to the Columbia and southward east of the Sierras, to Arizona and New Mexico.

13. **L. Kingii,** Watson. Resembles the last, but more slender and *villous with soft white hairs: racemes very short, few-flowered, on long slender peduncles:* pods and seeds smaller. — Proc. Am. Acad. viii. 534. *L. Sileri,* Watson. Utah, Colorado, and southward along the Rio Grande.

4. TRIFOLIUM,[1] L. CLOVER.

Herbs with palmately compound leaves, stipules adnate to the petiole, flowers in capitate racemes, spikes, or umbels, peduncles axillary or only apparently terminal. — Watson Rev. Proc. Am. Acad. xi. 127.

* *Leaflets* 5 *to* 7: *heads not involucrate, terminal and axillary: flowers sessile: calyx-teeth filiform, plumose: low or dwarf perennials.*

1. **T. megacephalum,** Nutt. Stout, somewhat villous: leaflets cuneate-oblong to obovate, obtuse, toothed: flowers very large (1 inch long), purplish, in spicate heads: calyx half as long, the teeth very much longer than the tube: pod stipitate, smooth. — Torr. & Gray, Fl. i. 315. Head-waters of the Missouri, to Washington Territory and N. E. California.

* * *Leaflets* 3: *heads not involucrate, terminal: flowers sessile or nearly so: perennial or biennial.*

+ *Caulescent, often tall: calyx-teeth very narrow, shorter than the corolla.*[2]

2. **T. eriocephalum,** Nutt. *Villous with spreading hairs,* or the stem and leaves rarely glabrous: leaflets narrowly oblong or sometimes broader,

[1] *Medicago sativa,* L., has leaves pinnately 3-foliolate, the leaflets obovate-oblong, and purple flowers. — Known as "Lucerne," and introduced into Wyoming, Utah, and westward.

[2] *T. pratense,* L., the common Red Clover, is becoming introduced and may be known by its oval or obovate leaflets often notched at the end and marked above with a pale spot, broad bristle-pointed stipules, ovate sessile heads of rose-purple flowers, and scarcely hairy calyx.

T. repens, L., the White Clover, is also introduced, and may be known by its creeping stems, axillary peduncles, inversely heart-shaped or merely notched leaflets, narrow stipules, long petioles and peduncles, the short pedicels reflexed when old, and the white flowers turning brownish in fading.

serrulate: *flowers in dense ovate spikes, at length reflexed, ochroleucous: calyx-teeth very villous,* lax, *nearly equalling the petals:* ovary hairy. — Torr. & Gray, Fl. i. 313. S. W. Colorado, N. California, Oregon and Idaho.

3. **T. longipes,** Nutt. Slender: *stem usually glabrous, the leaflets and calyx sparingly villous:* leaflets narrowly oblong to linear, serrulate: *heads ovate, looser than in the last, not reflexed:* flowers ochroleucous or tinged with purple: calyx-teeth straight, more or less hairy, *shorter than the corolla.* — Torr. & Gray, Fl. i. 314. From N. Arizona and Colorado to the British boundary, and west to the Pacific.

Var. (?) **latifolium,** Hooker. Often low: leaflets broader: flowers pedicellate in loose heads. — With the species.

4. **T. Kingii,** Watson. *Glabrous throughout:* leaflets oblong to oblanceolate, very acute, sharply denticulate: peduncles exceeding the leaves: *heads naked, the purplish flowers at length reflexed;* the rachis often produced above the head, with a few spinescent bracts: *calyx-teeth about one third the length of the corolla.* — Bot. King's Exp. 59. *T. Haydeni,* Porter in Hayd. Rep. 1871. From Montana through Idaho and Utah to N. E. California.

+ + Dwarf, cespitose, acaulescent or nearly so.

++ Glabrous: flowers large: ovary smooth, linear, 4 to 7-ovuled.

5. **T. nanum,** Torr. Leaflets small, *oblanceolate, serrulate,* strongly veined: *peduncles very short,* radical: *flowers* 1 *to* 3, dark purple: *calyx-teeth broad,* acute, *shorter than the tube: ovary* 4 *to* 5*-ovuled.* — Mountains of Colorado and Utah.

6. **T. Brandegei,** Watson. Leaflets *elliptic-oblong,* thin, *entire: peduncles about equalling the leaves: flowers spicate in a loose naked head,* purplish: *calyx-teeth lanceolate,* acuminate, *a little longer than the tube: ovary stipitate,* 7*-ovuled.* — Proc. Am. Acad, xi. 130. S. W. Colorado and N. W. New Mexico.

++ ++ Pubescent: flowers small: ovary obovate, densely villous, 2*-ovuled, at length exserted from the calyx.*

7. **T. gymnocarpon,** Nutt. Leaflets ovate-oblong to oblanceolate, serrate: peduncles shorter than the leaves: flowers 2 to 6, in rather close heads, on short pedicels: calyx-teeth equalling the tube. — Torr. & Gray, Fl. i. 320. Bot. King's Exp. 62, t. 8. W. Wyoming and the Wahsatch.

** * * Leaflets* 3*: heads subtended by a mostly monophyllous usually many-cleft involucre, axillary: flowers in whorls, sessile or nearly so, not reflexed.*

+ Low or dwarf perennials, acaulescent or nearly so: flowers rather large: involucre parted, somewhat scarious.

8. **T. Parryi,** Gray. *Glabrous,* often stout: *leaflets oblong to oblanceolate, sharply dentate:* bracts 5 to 7, *oblong, obtuse:* flowers 20 or more in a head: calyx-teeth broadly subulate, *equalling the tube:* corolla rose-purple. — Am. Jour. Sci. II. xxxiii. 409. — Mountains of Colorado, Utah, and Wyoming.

9. **T. dasyphyllum,** Torr. & Gray. Cespitose: *leaves, peduncles, and calyx more or less silky: leaflets linear-lanceolate, entire:* head globose, on a long radical peduncle: bracts very small, *unequal, lanceolate:* calyx-teeth linear, *much longer than the tube.* — Mountains of Colorado, and the Uintas.

10. **T. andinum,** Nutt. Cespitose, *silky-canescent: leaflets rigid, cuneate-oblong, entire,* strongly veined: peduncles radical, about equalling the leaves:

heads hemispherical: *involucre of* 2 *broadly stipuled* 3*-foliolate leaves: ovary one-ovuled.* — Watson, Bot King's Exp. 60, t. 8. W. Wyoming and N. E. Utah.

+ + *Slender annuals, glabrous: lobes of the involucre laciniately and sharply toothed.*

11. **T. involucratum,** Willd. Branching from the base: leaflets mostly oblanceolate, *acute at each end, spinulosely-serrulate: flowers in close heads, purple tipped with white: calyx-teeth thin: ovules several.* — From Mexico to the British boundary, and from Colorado and New Mexico to the Pacific.

12. **T. pauciflorum,** Nutt. Very slender: stems ascending or decumbent: leaflets obovate or oblanceolate or sometimes linear, *usually obtuse or retuse, serrulate: heads rather few-flowered: involucre small:* flowers little exceeding the calyx, deep purple or light rose-colored: *calyx-teeth rigid, setosely acuminate: ovules two.* — *T. variegatum,* Nutt., in Bot. King's Exp. and Hayd. Rep. 1872. From Washington Terr. and Montana to S. California and Utah.

5. HOSACKIA, Douglas.

Calyx-teeth nearly equal, usually shorter than the tube. Petals free from the stamens, nearly equal; keel somewhat incurved. Pod sessile, partitioned between the seeds. — Herbaceous: leaves (in ours) 1 to 5-foliolate; stipules minute and gland-like. — Watson in Bot. King's Exp. 432.

1. **H. Wrightii,** Gray. *Perennial: ashy-pubescent,* bushy-branched, very leafy: leaflets 3 to 5, apparently palmate and sessile, *the lowest oblong, the rest filiform-linear: peduncles short, rarely equalling the leaf,* 1 to 2-flowered: calyx-teeth setaceous-subulate, *about equalling the tube: keel not falcately-attenuate, mostly very obtuse.* — S. W. Colorado, New Mexico, and Arizona.

2. **H. Purshiana,** Benth. *Annual: more or less silky-villous* or sometimes glabrous: leaves nearly sessile; leaflets 3 (or 1, rarely 4), *varying from ovate to lanceolate: peduncles exceeding the leaves, one-flowered:* calyx-teeth linear, *much longer than the tube,* about equalling the corolla: *keel attenuated upward, falcate, mostly acute.* — From Washington Terr. to Northern Mexico, eastward to the Upper Missouri, Arkansas, and N. Carolina.

6. PSORALEA, L.

Two upper calyx-lobes often connate. Keel united with the wings. Stamens mostly diadelphous. Pod sessile, thick and often wrinkled. — Perennial herbs: leaves (in ours) digitate, the leaflets entire; stipules not adnate to the petiole: flowers white or purplish.

* *Flowers in panicled racemes.*

1. **P. tenuiflora,** Pursh. Slender, much branched and bushy, minutely hoary-pubescent when young: leaflets varying from linear to obovate-oblong: lobes of the calyx and bracts ovate, acute: pod glandular. — *P. floribunda,* Nutt. From Texas to Arizona, northward to the Missouri River and eastward into Illinois.

* * *Flowers in interrupted spikes: peduncles and lower tooth of the calyx elongated.*

2. **P. argophylla,** Pursh. *Silvery silky-white all over,* divergently branched: *leaflets elliptical-lanceolate: lobes of the calyx and bracts lanceolate.* — From N. Wisconsin to the Saskatchewan and Upper Missouri, and in Colorado.

3. **P. campestris,** Nutt. Like the last but *much less hirsute and silvery,* with short white appressed hairs, and more branching: *stipules linear; leaflets linear or oblong-linear,* rather obtuse, *nearly glabrous above:* bracts 3-flowered, *broadly ovate.* — Plains of the Platte.

4. **P. digitata,** Nutt. *Canescent,* diffusely branched: *stipules lanceolate, reflexed; leaflets cuneate-oblong and oblong-linear with an abrupt rigid point,* smooth and minutely dotted above, hirsute beneath: *bracts obcordate or reniform:* lobes of the calyx ovate: pod hirsute, not wrinkled. — S. E. Colorado and southeastward along the Red River into Arkansas.

* * * *Flowers in capitate or oblong dense spikes.*

← *Root tuberous.*

5. **P. esculenta,** Pursh. *Roughish-hairy all over: stem stout: leaflets obovate or lanceolate-oblong: spikes oblong, long-peduncled:* lobes of the calyx and bracts lanceolate. — High plains from the Saskatchewan to Louisiana and Texas.

6. **P. hypogæa,** Nutt. *Acaulescent: hirsute with whitish appressed hairs: leaflets linear-lanceolate* or linear-oblong, nearly glabrous above: *spikes capitate, on peduncles much shorter than the petioles:* lobes of the calyx linear, acuminate, the lowest lanceolate, elongated. — Sandy plains of N. Colorado (*Greene*), and along the Platte.

← ← *Root not tuberous.*

7. **P. lanceolata,** Pursh. *Glabrous,* or with a few scattered hairs: *stipules linear-lanceolate;* leaflets linear to oblong-obovate, acute: *peduncles about equalling the leaves: calyx very small, its teeth short, obtuse, nearly equal:* ovary very silky: pod very glandular. — Washington Terr. to N. Arizona and eastward to the Saskatchewan and Nebraska.

8. **P. cuspidata,** Pursh. *Canescent with appressed pubescence: stipules subulate;* leaflets obovate or elliptical-oblong, pubescent: *peduncles much longer than the leaves: calyx large, somewhat inflated, gibbous at the base, conspicuously dotted, teeth triangular-lanceolate, acuminate, the lower one produced:* pod hid in the large calyx. — From S. E. Colorado to Texas and Arkansas.

7. DALEA, L.

Calyx (in ours) deeply cleft, with plumose teeth. Standard cordate, its claw free. Pod ovate, compressed, included in the calyx. — Leaflets small, entire, sometimes stipellate.

* *Glabrous: flowers not yellow: leaflets 4 to 20 pairs, dotted.*

1. **D. alopecuroides,** Willd. Erect annual, 1 to 2 feet high: *leaflets 10 to 20 pairs, linear-oblong: flowers light rose-color, in cylindrical spikes:* bracts

conspicuous, ovate, *pubescent, deciduous:* calyx *very villous*, with long slender teeth. — From Colorado to S. Arizona and eastward to the Mississippi from Texas to Illinois.

2. **D. laxiflora,** Pursh. Erect, 3 to 4 feet high: branches slender and spreading: *leaflets 4 to 5 pairs, linear-oblong: spikes panicled*, few-flowered: flowers distant, *white:* bracts very broad, *almost orbicular, glandular, coriaceous, glabrous*, slightly cuspidate: calyx-teeth beautifully plumose. — From Colorado to the plains of the Missouri, and southeastward to Arkansas and Texas.

3. **D. formosa,** Torr. Suffruticose, much branched: leaflets very small, *about 5 pairs, cuneate-oblong, retuse, dotted with black glands beneath: spikes loose*, few-flowered, on short peduncles: flowers large and showy, *bright purple:* bracts ovate, *silky-villous on the margin.* — On the Platte (*James*), and southward.

* * *Not glabrous: flowers yellow (deep purple in No. 7).*

\+ *Leaves palmately trifoliolate, not dotted.*

4. **D. Jamesii,** Torr. & Gray. Stems several from one root, 4 to 9 inches high, somewhat woody at base: whole plant silky-pubescent: leaflets obovate, very obtuse: spikes oblong, sessile, dense and broad; bracts ovate, acuminate, villous. — S. Colorado and southeastward.

\+ \+ *Leaves pinnately compound, with 2 to 6 pairs of leaflets.*

5. **D. aurea,** Nutt. Stem pubescent, *erect*, 2 feet high: *leaflets 3 to 4 pairs, oblong-obovate and linear-oblong, more or less silky-pubescent:* spikes ovate, very compact, on long peduncles: bracts rhombic-ovate, as long as the calyx. — On the plains from the Missouri River to Texas.

6. **D. rubescens,** Watson. Like the last but *more slender, the leaves trifoliolate*, and the flowers smaller, *the yellow petals becoming purplish.* — Proc. Am. Acad. xvii. 369. *D. nana*, Torr., var. *elatior*, Gray. S. E. Colorado, southward and eastward.

7. **D. lanata,** Spreng. *Decumbent, canescently tomentose throughout:* the stems 1 to 3 feet long: *leaflets 4 to 6 pairs, obovate-cuneate, emarginate: spikes usually opposite the leaves.* — From Nebraska, Arkansas, and Indian Territory to Texas, New Mexico, S. Colorado, and Utah.

8. PETALOSTEMON, Michx. Prairie Clover.

Similar to the last, but with only 5 stamens and the flowers always in dense bracteate cylindrical spikes.

* *Smooth or nearly so: leaflets 5 to 9: spikes globose to cylindrical.*

1. **P. violaceus,** Michx. *Leaflets 5, narrowly linear:* spikes globose-ovate, or oblong-cylindrical when old: bracts pointed, *not longer than the silky-hoary calyx: corolla rose-purple.* — Prairies from the Saskatchewan to Texas, and from Colorado to Indiana.

2. **P. candidus,** Michx. *Leaflets 7 to 9, lanceolate or linear-oblong:* spikes oblong, cylindrical when old: bracts awned, *longer than the nearly glabrous calyx: corolla white.* — With the last.

3. **P. macrostachyus,** Torr. *Leaflets 5 to 7, lanceolate-oblong, obtuse, dotted beneath:* spikes cylindrical, elongated: *bracts as long as the flower: calyx silky-villous: corolla nearly white.* — From Colorado to Oregon.

* * *Soft downy or silky-villous all over: leaflets* 13 *to* 17: *spikes cylindrical.*

4. **P. villosus,** Nutt. Leaflets linear or oblong: spikes 1 to 5 inches long, short-peduncled: corolla rose-color. — Along the Upper Missouri and Mississippi to N. Wisconsin.

9. AMORPHA, L. False Indigo. Lead Plant.

Standard erect, folded together. — The flowers purple or violet, small, in dense clustered terminal spikes.

* *Pods* 1*-seeded: leaflets small, crowded.*

1. **A. canescens,** Nutt. *Whitened with hoary down,* 1 *to* 3 *feet high:* leaflets 15 to 25 pairs, elliptical, smoothish above with age. — From British America to Texas and from Colorado to Indiana.

2. **A. microphylla,** Pursh. *Very low, nearly glabrous:* leaflets somewhat ovate-elliptical, rigid: spikes solitary and aggregated. — Along the Platte to the mountains and northward to the plains of the Red River.

* * *Pods* 2*-seeded: leaflets scattered.*

3. **A. fruticosa,** L. Rather pubescent or smoothish: leaflets 8 to 12 pairs, oval. — Along rivers from Colorado northeastward to British America and eastward to Pennsylvania and Florida.

10. PETERIA, Gray.

Calyx tubular at base, gibbous above. Standard open at the apex, with reflexed sides, narrowed into a long claw. Ovary stipitate.

1. **P. scoparia,** Gray. Rigid, branching, glabrous: leaflets numerous, very small, entire; stipules small, subulate: flowers scattered, yellowish. — Pl. Wright. i. 50. S. W. Colorado and southward.

11. ROBINIA, L. Locust.

Calyx slightly 2-lipped. Standard large and rounded, turned back. — Trees or shrubs, often with prickly spines for stipules: flowers showy, in hanging axillary racemes. Base of the leaf-stalks covering the buds of the next year.

1. **R. Neo-Mexicana,** Gray. Shrub 4 to 6 feet high: stipular prickles subrecurved, sharp and stout: leaflets elliptical or oblong: peduncles and the short crowded racemes hispid with straight glanduliferous hairs: calyx finely hispid: corolla rose-color: pods glandular-hispid. — S. Colorado and southward.

12. GLYCYRRHIZA, L. Liquorice.

Flowers nearly as in *Astragalus.* Ovary sessile: style short and rigid. Pod compressed, and often curved. — Erect perennial herbs: flowers in dense axillary pedunculate spikes, with caducous bracts: root large and sweet.

1. **G. lepidota,** Pursh. Somewhat glandular-puberulent, or the younger leaves slightly silky: leaflets 6 to 8 pairs, oblong-lanceolate: spike short: flowers ochroleucous: pod thickly beset with hooked prickles. — From Colorado to New Mexico, westward into Nevada and N. California, and northward to Washington Territory, and across the continent to Hudson's Bay.

13. ASTRAGALUS, Tourn. Rattle-weed.

Corolla and its slender-clawed petals usually narrow. — Herbs, or a few woody at base: with rather small flowers, chiefly in simple axillary spikes or racemes: the peduncle commonly elongated. — Gray, Proc. Am. Acad. vi. 188. Watson, Bot. King's Exp. 435.

Series I. *Pod completely or imperfectly 2-celled by the intrusion of the dorsal suture, the ventral suture being not at all or less deeply inflexed.* — Astragalus, L.

Artificial Key.

Pod succulent, becoming thick and fleshy, sessile . . . . . Nos. 1, 2, 3
Pod not 2-celled, inflated, not mottled, sessile; plant hirsute-canescent . . . 27
Pod completely 2-celled, bladdery-inflated, often mottled, sessile; plant nearly glabrous 4
Pod coriaceous, cartilaginous, or chartaceous, not bladdery-inflated,
1. Conspicuously stipitate, the stipe about equalling or surpassing the calyx,
Not sulcate 20, 21
Deeply sulcate.
Pod glabrous, pendent 14, 15, 16
Pod black-hairy 24
2. Short-stipitate,
Not sulcate. 22
Sulcate,
Incurved, mottled 25
Straight,
Completely 2-celled 11, 13
Incompletely 2-celled 23, 26
3. Sessile.
Completely 2-celled,
Glabrous 5, 7
Pubescent or hoary 8, 9, 10, 12
Villous or woolly 6
Incompletely 2-celled.
Stems a span or more high 18, 19
Stems not rising so high, or none at all.
Pod straight or nearly so 17, 28
Pod curved 29, 30, 31, 32

Systematic Synopsis.

§ 1. *Pod plum-shaped, succulent, becoming thick and fleshy, indehiscent, not stipitate, completely 2-celled.* — *Perennials, with low leafy stems: stipules distinct, nearly free: racemes short, spike-like.*

* *Ovary and pod glabrous.*

1. **A. caryocarpus,** Ker. *Grayish with an appressed pubescence: flowers violet:* pod globose or ovate, *usually pointed.* — Plains from the Saskatchewan to Texas.

2. **A. Mexicanus,** A.DC. Taller, greener, *less pubescent: flowers lighter-colored or white: calyx softly white-villous* or tomentose: pod ovate-globose, *scarcely pointed.* — From Colorado to Missouri and S. Texas.

* * *Ovary hoary-hirsute: pod sometimes becoming glabrate.*

3. **A. Plattensis,** Nutt. Loosely villous: flowers ochroleucous or purplish above; pod ovate, acuminate, or oblong and somewhat curved. — From Colorado to Nebraska and Illinois, and southward to Texas and N. Alabama.

§ 2. *Pod ovate or globose, membranous, inflated, nearly glabrous, sessile, completely 2-celled and more or less didymous by the intrusion of both sutures, many-seeded. —Stipules distinct, adnate: flowers spicate.*

4. **A. diphysus,** Gray. Nearly glabrous throughout: leaflets 6 to 11 pairs, obovate or oblong: flowers blue or purple, occasionally white: pod curved-acuminate, frequently mottled — S. W. Colorado, southward, and westward in the Great Basin.

§ 3. *Pod cartilaginous or coriaceous, sessile, oblong, turgid, terete, sulcate at both sutures, at length incurved, completely 2-celled. — Subacaulescent, shining with a soft silky-villous often yellow pubescence: peduncles long, scape-like: spikes dense: flowers violet.*

5. **A. mollissimus,** Torr. *Pod narrow-oblong,* 5 to 9 lines long, *glabrous,* subdidymous: ovary also glabrous. — From Colorado to Nebraska and W. Texas.

6. **A. Bigelovii,** Gray. *Pod oval-oblong,* 6 lines long, *densely woolly,* but slightly sulcate. — From S. W. Colorado to Texas and Mexico.

§ 4. *Pod coriaceous, turgid, oblong, terete, scarcely sulcate and only on the back, nearly straight, sessile, completely 2-celled. — Tall, with appressed gray pubescence or glabrate: spikes dense: flowers whitish, ochroleucous or purplish: stipules distinct or united, free.*

7. **A. Canadensis,** L. Leaflets 10 *to* 14 *pairs,* elliptical or oblong, obtuse: *pod and ovary glabrous.* — From Colorado to the head-waters of the Columbia and Saskatchewan, and eastward to the Atlantic States.

8. **A. Mortoni,** Nutt. Differs from the last in the *somewhat pubescent ovary and pod,* and the latter more decidedly sulcate dorsally and less crowded in the matured spike, and the *leaflets* 6 *to* 8 *pairs.* — *A. Canadensis,* var. *Mortoni,* Watson. Head-waters of the Missouri and Platte, westward into Utah, Nevada, and California.

§ 5. *Pod coriaceous, oblong or ovate, straight or slightly curved, usually more or less compressed-triangular, dorsally sulcate (cross-section obcordate), completely 2-celled, pubescent. — Caulescent, grayish short-pubescent or glabrate: stipules more or less sheathing.*

9. **A. adsurgens,** Pall. *Rather stout: spikes at length oblong or cylindrical: flowers purplish: pod sessile.* — From Colorado to Oregon, Nebraska, and the Saskatchewan.

10. **A. terminalis,** Watson. *Slender: leaves long-petiolate:* raceme an inch long, *open, long-pedunculate:* flowers nearly sessile, *reflexed, purplish: pod sessile, straight,* erect. — Proc. Am. Acad. xvii. 370. S. Montana.

11. **A. hypoglottis,** L. *Slender: flowers capitate, violet: pod silky-villous, very shortly stipitate.* — From S. Colorado northward along the mountains and Red River Valley to Alaska and the Arctic Circle.

12. **A. ventorum,** Gray. Stems *flexuous,* 4 to 6 inches high, simple: leaflets broadly obovate: raceme loose, short-peduncled, equalling the leaves: *flowers light yellow: pod sessile, slightly curved.* — Watson in Am. Naturalist, viii. 212. Wind River, Wyoming, *Parry.*

§ 6. *Pod coriaceous, obovoid, straight, short-stipitate, dorsally sulcate, ventral suture rather prominent, completely* 2*-celled.* — *Low, caulescent: flowers very small, white or cream-color, tinged with purple.*

13. **A. Brandegei,** Porter. Canescent with minute appressed hairs: branching from a somewhat woody base: leaflets linear: racemes on long peduncles, loosely few-flowered: pod hairy. — Fl. Colorado, 24. Banks of the Arkansas near Cañon City, Colorado, *Brandegee.*

§ 7. *Pod exsert-stipitate, pendent, very glabrous, straight or falcate, narrow, more or less triangular, very deeply sulcate dorsally, the suture intruded to the middle or beyond.* — *Stems erect, stout, sulcate, very leafy: flowers in long crowded racemes, rather large.*

14. **A. Drummondii,** Dougl. *Softly villous: calyx scarcely gibbous at base, black-hairy:* corolla white: pod *long-linear, terete, cross-section obcordately* 2*-lobed.* — From Colorado to Nebraska and the Saskatchewan.

15. **A. scopulorum,** Porter. *Pubescent with appressed hairs: calyx gibbous at base, pilose with blackish hairs:* corolla yellow or ochroleucous: pod *oblong, becoming arcuate with age, sharply* 3*-angled,* the dorsal suture with an acute sulcus on each side. — Fl. Colorado, 24. *A. subcompressus,* Gray. Central and Southern Colorado.

16. **A. racemosus,** Pursh. *Appressed pubescent, glabrate: calyx strongly gibbous at base, whitish-puberulent:* corolla white: pod *lance-oblong, cross-section somewhat equally triradiate.* — From Colorado to Nebraska and Idaho.

§ 8. *Pod sessile, coriaceous, obcompressed, with the impressed dorsal suture more or less approaching the ventral, but not* 2*-celled.* — *Low or prostrate, with a fine hoary pubescence: flowers spicate, deep yellow.*

17. **A. flavus,** Nutt. Diffuse: stipules sheathing the stem and base of the petiole, oblique: leaflets linear: pod half-included, hoary, ovate, straight. — W. Wyoming, *Parry,* and westward.

§ 9. *Pod* 2 *to* 3 *lines long, sessile, elliptic-ovate, always wholly one-celled, the ventral suture thick and prominent.* — *Subcinereous: stems slender, rather rigid, a foot high or more: leaflets* 5 *to* 8 *pairs, linear: racemes spike-like: flowers purple to whitish.*

18. **A. gracilis,** Nutt. *Stems virgate:* leaflets nearly filiform: racemes *dense, elongated,* long-peduncled: *flowers pale purple or whitish:* pods spreading, coriaceous, *strongly concave on the back, white-hairy,* at length glabrous, *transversely rugose-veined.* — From Colorado to Nebraska and Missouri.

19. **A. microlobus,** Gray. *Stems diffuse:* leaflets shorter, linear or oblong-linear: *racemes rather short and usually loosely flowered: flowers deep purple: pods reflexed,* thick-cartilaginous, *puberulent, finely rugulose, a little flattened on the back,* the ventral suture very thick. — Proc. Am. Acad. vi. 203. From the Rocky Mountains to Missouri and Nebraska.

§ 10. *Pod stipitate, coriaceous or nearly membranous, scarcely or not at all obcompressed,* 1*-celled or imperfectly* 2*-celled.* — *Caulescent, slender: flowers in short often spike-like racemes, or few in small heads, purple to white, spreading.*

* *Pod membranous, glabrous or pubescent, slightly more compressed laterally,* 1*-celled with a very narrow rudimentary septum from the straight dorsal suture, the ventral suture gibbous.*

+– *Pod long-stipitate, not sulcate, cross-section oval: flowers white or bluish, keel violet.*

20. **A. aboriginum,** Rich. *Hoary-pubescent or subvillous:* stems numerous, rigid: leaflets 3 to 6 pairs, linear or oblong-lanceolate: *pod semi-elliptic.* — Mountains of Colorado, northward throughout W. British America.

21. **A. glabriusculus,** Gray. Like the last: *glabrous* or with short scattered hairs: leaflets thinner, green, linear-lanceolate: *pod lanceolate-subfalcate,* the stipe 2 to 3 times longer than the calyx. — Proc. Am. Acad. vi. 204. Mountains of Colorado and British America.

+– +– *Pod short-stipitate, cross-section obovate, pubescent with more or less nigrescent hairs: flowers white.*

22. **A. Robbinsii,** Gray, var. **occidentalis,** Watson. Pod much compressed, tapering at base to a very short stipe, with no indication of a dorsal sulcus. — Bot. King's Exp. 70. S. W. Colorado and Nevada.

* * *Pod more coriaceous, black- or rarely cinereous-pubescent, more or less triangular and semi 2-celled, the dorsal suture sulcate-impressed.*

+– *Pod lens-shaped, the cross-section obcordate, the ventral suture a little the more gibbous.*

23. **A. oroboides,** Hornem., var. **Americanus,** Gray. Subcinereous-puberulent: stems 1 to 1½ feet high: leaflets 5 to 7 pairs, oblong and oval or often linear-oblong: flowers in a long secund raceme, the wings exceeding the keel: pod with gray pubescence; stipe very short. — Proc. Am. Acad. vi. 205. In the Rocky Mountains from Colorado northward into British America, thence eastward to Labrador.

+– +– *Pod triangular, more impressed, the cross-section deeply obcordate, rather straight or incurved, gibbous on the back.*

24. **A. alpinus,** L. Hairy-pubescent or glabrous: *leaflets 6 to 12 pairs, oval or oblong:* racemes short or subcapitate, many-flowered: *wings little if at all exceeding the rather large keel: pod straight or recurved, black-villous or -pubescent; stipe usually exceeding the calyx.* — Colorado, Wyoming, and northward to Arctic America; also in Maine and Vermont.

25. **A. sparsiflorus,** Gray. Slightly appressed-pilose, glabrate: *leaflets 4 to 6 pairs, obovate or subrounded:* peduncles 3 to 10-flowered: the emarginate or bifid banner and *the wings much exceeding the incurved keel: pod incurved, mottled; stipe very short.* — Proc. Acad. Philad. 1863, 60. Colorado.

§ 11. *Closely resembling the last, but villous or canescent, lower, and with yellowish flowers: pod semi-ovate or oblong, turgid, coriaceous, subtriangular, with the back gibbous and more or less impressed, the ventral suture prominent.*

26. **A. lotiflorus,** Hook. Heads few-flowered: corolla little exceeding the calyx: the cross-section of the pod obovate, retuse, or usually broadly obcordate toward the base. — From Colorado and Wyoming to Texas, Nebraska, and Hudson's Bay.

§ 12. *Pod sessile, mostly thick coriaceous and obcompressed, the impressed dorsal suture more or less approaching the ventral, not 2-celled, pubescent. — Low, white-silky or hoary: flowers spicate or subcapitate, usually violet or purplish.*

* *Annual or biennial, many-stemmed: flowers rather small: pod inflated, membranous, incurved.*

27. **A. pubentissimus,** Torr. & Gray. Dwarf, hirsute-canescent: leaflets oblong or obovate: flowers few: pod villous, ovate-lunate, strongly incurved. — Colorado and W. Wyoming.

* * *Perennial, short-stemmed or scarcely caulescent, usually prostrate or matted: flowers rather large: pod thick-coriaceous, obcompressed-triangular, transversely rugulose.*

28. **A. Missouriensis,** Nutt. Subcaulescent, *hoary-silky with a short very closely appressed pubescence:* peduncles scape-like, capitately or spicately few-flowered: *pod nearly straight, blackish, elliptic.* — From New Mexico to Nebraska and the Saskatchewan.

29. **A. Shortianus,** Nutt. Usually subacaulescent, *silky-canescent with a very closely appressed pubescence:* leaflets obovate or ovate: *pod strongly arcuate, thick, puberulent, ovate-lanceolate to lanceolate-linear.* — Includes *A. cyaneus* of most of the western reports. From Colorado to Nebraska and westward; also southward into New Mexico.

30. **A. Parryi,** Gray. Stems short, *villous, with loose spreading hairs: flowers loosely subcapitate,* whitish or yellowish, the keel tinged with purple: *pod arched or at length circinate, pubescent, oblong-lanceolate, strongly obcompressed and rugulose, both sutures sulcately impressed, contiguous.* — Am. Jour. Sci. II. xxxiii. 410. From Colorado to N. W. Texas.

31. **A. iodanthus,** Watson. Canescent with an appressed hairy pubescence, or *usually nearly glabrous* with scattered hairs upon the petioles and margins of the leaves: stems decumbent: *leaflets obovate or orbicular: spikes short, dense: pod strongly arcuate or hamate, nearly glabrous, mottled, linear-oblong, irregularly folded.* — Bot. King's Exp. 70. Colorado (*Coulter*) and Nevada.

32. **A. glareosus,** Dougl. *Depressed, villous-silky with white incumbent hairs:* flowers 3 to 6: *pod incurved, silky-pubescent becoming subglabrous, oblong-ovate, attenuate above.* — Wyoming and S. Idaho.

SERIES II. *Pod one-celled, neither suture being inflexed or the ventral more intruded than the dorsal.* — PHACA, L.

A. *Leaves pinnate with many or rarely with few or abortive leaflets, or simple.*

Artificial Key.

Leaflets prickly pointed and rigid, persistent . . . . . No. 61
Leaflets not prickly pointed.
Pod inflated,
Stipitate,
Mottled 36
Not mottled.
Stipe very short 37
Stipe equalling or exceeding the calyx 38, 39
Sessile.
Annual; pod 7 to 12 lines long 34, 35
Perennial; pod 2 to 4 lines long 40, 41, 42, 43
Pod coriaceous or cartilaginous, not bladdery inflated,
Exsert-stipitate,
Deeply sulcate 44, 45
Not deeply sulcate 53

Short-stipitate,
Glabrous 50, 52
Puberulent 49, 51
Sessile,
Glabrous 46, 47, 60
Puberulent or pubescent.
Stems a span or more high 56, 57, 58
Cespitose 54, 55, 59
Woolly or villous 33, 48

Systematic Synopsis.

§ 13. *Pod very woolly, short, turgid, coriaceous, incurved, sessile.—Very soft-woolly: stems short, prostrate, from a stout perennial root: flowers usually one inch long, loosely subcapitate.*

33. **A. Purshii,** Dougl. Nearly acaulescent, rarely 6 inches high, canescent with a long and dense woolly pubescence: leaflets lanceolate or oblong: flowers ochroleucous, with the keel sometimes purplish.—W. Wyoming to California and Oregon.

§ 14. *Pod membranous, inflated, globose, egg-shaped or semi-ovate, usually large, finely reticulated, glabrous or glabrate.*

* *Annual: pod sessile, not mottled: flowers small, ochroleucous or purplish. Low, leaflets linear or linear-oblong, gray with strigulose hairs.*

34. **A. triflorus,** Gray. Cinereous-pubescent, *very much branched from the base,* branches ascending, 6 to 12 inches high: *flowers 3 to 15: pod oval, obtuse or acutish.*—Pl. Wright. ii. 45. S. Colorado and southward into Mexico.

35. **A. Geyeri,** Gray. *Somewhat simple,* 3 to 6 inches high, subcanescent, with an appressed hairy pubescence: leaflets glabrous above: *flowers 3 to 5: pod ovate-lunate with an incurved acumination.*—Proc. Am. Acad. vi. 214. Wyoming, Idaho, and W. Nevada.

* * *Annual or perennial: pod stipitate.*

+ *Pod mottled: stipe equalling the calyx: flowers few, rather small.*

36. **A. pictus,** Gray. Hoary with a loose silky pubescence: leaflets 3 to 7 pairs, narrowly linear or filiform, most of them usually abortive: pod ovoid, scarcely pointed, pendent.—Proc. Am. Acad. vi. 214. From Nebraska to Idaho and New Mexico. In sandy places.

Var. **filifolius,** Gray. Leaves usually imperfect; leaflets very few, mostly attenuated, the terminal one or the filiform rachis produced, persistent.—Loc. cit. 215. On the plains of Colorado and southward.

+ + *Pod not mottled.*

++ *Nearly stemless, few-flowered: leaflets 4 to 6-paired: pod with a very short stipe.*

37. **A. megacarpus,** Gray. Glabrous: leaflets broadly oval or ovate: scape much shorter than the leaves: flowers ochroleucous or whitish: pod ovate-oblong, acuminate, very obtuse at base.—Loc. cit. 215. "Plains of the Rocky Mountains" (*Nuttall*).

++ ++ *Caulescent, rather tall, leafy: leaflets 7 to 9-paired: racemes or spikes mostly many-flowered: pod with a stipe equalling or exceeding the calyx.*

38. **A. frigidus,** Gray, var. **Americanus,** Watson. Subglabrous: leaflets ovate- or elliptic-oblong: peduncles equalling the leaves: flowers white: pod oblong, acute at each end, black-hairy or glabrous. — Bibl. Index, i. 193. *A. frigidus* of Bot. King's Exp., Hayd. Rep. 1871, and Fl. Colorado. In the mountains from Colorado to the Arctic regions.

§ 15. *Pod membranous, lanceolate-cylindric, straight, exsertly-stipitate, glabrous: flowers rather large: leaflets few or almost none.*

39. **A. lonchocarpus,** Torr. Ashy-puberulent, glabrate: stem fistulous, branched: leaflets filiform-linear, remote, the leaf sometimes reduced to the flattened-filiform rachis: racemes loosely many-flowered: flowers white, pendent: pod very sharply acuminate at each end. — Pac. R. Rep. iv. 80. S. Colorado to New Mexico and Utah.

§ 16. *Pod membranous or chartaceous, small, globose or ovate, inflated, sessile. — Diffuse or procumbent, mostly small and slender: flowers small and usually few.*

40. **A. microcystis,** Gray. *Ashy-pubescent,* from a woody root: *leaflets 4 to 6 pairs, oblong or oblong-lanceolate, obtuse:* racemes 5 to 12-flowered: corolla violet or whitish: pod globose-ovate, 3 *lines long, thin membranous, gray-pubescent.* — Proc. Am. Acad. vi. 220. W. Wyoming (*Parry*) and Washington Territory.

41. **A. leptaleus,** Gray. *Nearly glabrous: leaflets 7 to 11 pairs, lance-linear or oblong, often acute:* peduncles 2 to 4-flowered: corolla white: pod ovate or oval, 4 *lines long, chartaceous, puberulent.* — Loc. cit. Colorado.

42. **A. jejunus,** Watson. *Dwarf, minutely hoary-pubescent:* stems 1 to 2 inches long, crowded, from a many-branching caudex, *covered with numerous imbricated stipules,* which are membranous, sheathing, truncate and ciliate: *leaflets 4 to 7 pairs, linear:* peduncles 2 to 3-flowered: corolla ochroleucous or tinged with violet: pod *gibbous dorsally, obtuse,* 4 *lines long, membranous, glabrous.* — Bot. King's Exp. 173, t. 13. Bear River Valley, near Evanston (*Watson*).

43. **A. humillimus,** Gray. Habit of the last, but much more dwarf and condensed: *stems scarcely an inch long, with the scarious coalescent stipules imbricate and petioles persistent and spinescent: leaflets 3 to 5 pairs, oblong, canescent, with revolute margins:* peduncles 1 to 3-flowered: corolla pale: pod ovate, 2 *lines long, coriaceous, with a white pubescence.* — Proc. Am. Acad. xii. 57. Often choked in drifting sand. Mesa Verde, S. W. Colorado (*Brandegee*).

§ 17. *Pod coriaceous, shortly exsert-stipitate, straight, narrowly oblong, semi-cylindric, the deeply concave ventral surface divided by the salient obtuse suture.*

44. **A. bisulcatus,** Gray. *Strigulose-puberulent: stem over a foot high, stout:* leaflets oblong, often narrower: *flowers violet, in dense spike-like racemes,* middle-sized: *calyx-teeth scarcely shorter than the tube.* — Pac. R. Rep. xii. 42, t. 1. From Colorado to Nebraska and the Saskatchewan.

45. **A. Haydenianus,** Gray. *Smaller, pubescence more cinereous: spike elongated, virgate: flowers much smaller: calyx-teeth much shorter than the tube: corolla white, keel tinged with purple at the end:* pod rugulose with transverse veins; stipe not exceeding the calyx. — Proc. Am. Acad. xii. 56. Colorado.

§ 18. *Pod thick-cartilaginous with a subfleshy epicarp, subovate or oblong, turgid, sessile, neither suture intruded, but both thick and prominent. — Perennial, a foot high, stem and leaves rather rigid: leaflets nearly filiform, not jointed to the rachis, persistent.*

46. **A. pectinatus,** Dougl. Ashy-puberulent, glabrate: branches striate, angled: *flowers white,* the banner elongated: pod *pendulous,* glabrous, cuspidate, the dorsal suture very thick. — From Colorado to Nebraska and the Saskatchewan.

47. **A. Grayi,** Parry. Distinguished from the last by the *broader leaflets,* quite strongly veined, and by the somewhat *thinner ascending pod: flowers light yellow.* — Watson in Am. Nat. viii. 212. W. Wyoming (*Parry*).

§ 19. *Pod coriaceous, ovate or oblong, rarely cylindrical, turgid, not sulcate and neither suture intruded. — Ours are perennials and the pods are sessile or scarcely stipitate.*

* *Nearly acaulescent, silvery-silky, large-flowered.*

48. **A. Newberryi,** Gray. Stems very short, crowded from a deep elongated root: leaflets 3 to 7, either broad- or narrow-obovate, approximate: peduncles few-flowered: corolla ochroleucous: pod villous, the broad point laterally compressed, subincurved. — Proc. Am. Acad. xii. 55. *A. Chamæluce,* Gray, in part. On the borders of Utah, Arizona, and S. W. Colorado.

* * *Glabrous or pubescent, stems ascending or erect: pod very shortly stipitate or sessile: calyx gray- or dark-pubescent.*

49. **A. Fendleri,** Gray. *Glabrous or appressed puberulent,* erect: *leaflets oblong or linear-oblong: racemes loosely purple-flowered:* pod straight, *minutely puberulent,* very shortly stipitate. — Pl. Wright. ii. 44. Colorado and New Mexico.

50. **A. Hallii,** Gray. *Subcinereous-pubescent,* glabrate, ascending: *leaflets narrow-oblong, subcuneate, retuse: flowers violet, in a dense head-like raceme:* pod straight, *glabrous,* with stipe a line long. — Proc. Am. Acad. vi. 224. Colorado to New Mexico.

51. **A. flexuosus,** Dougl. *Ashy-puberulent,* ascending: *leaflets oblong- or cuneate-linear,* obtuse or retuse: *racemes mostly elongated, loose:* corolla white or purplish: pod *cylindric, puberulent,* straight or subincurved, stipe very short but evident. — From Colorado to Nebraska and the Saskatchewan.

52. **A. Pattersoni,** Gray. Robust, a foot or two high, *appressed-puberulent,* sometimes glabrous: *leaflets oblong, thickish:* peduncles racemosely many-flowered: *corolla white,* the keel sometimes purplish at the tip: *pod glabrous, abruptly contracted within the calyx, becoming somewhat stipe-like.* — Loc. cit. xii. 55. S. W. Colorado and Utah.

§ 20. *Pod vetch-shaped, flattened or less compressed, straight, margined by the nerve-like sutures, coriaceous or chartaceous, sometimes stipitate. — Perennials, with the leaves pinnate with many or few leaflets, or in some species simple.*

* *Flowers in peduncled racemes or spikes: pod many* (7 *to* 20)*-ovuled.*

+ *Stipules connate, at least the lower ones: pod exsert-stipitate. Caulescent: leaves pinnate, with many leaflets.*

53. **A. multiflorus,** Gray. Somewhat glabrous: stems slender: stipules dark-colored; leaflets 6 to 10 pairs, linear or narrowly oblong: pedun-

cles not exceeding the leaves, loosely few-flowered: flowers ochroleucous, tinged with purple: pod oblong, reflexed. — Proc. Am. Acad. vi. 226. From Colorado to the plains of Nebraska, northward to lat. 65°, and westward to Utah, Nevada, and S. California.

+– +– *Stipules as before: pod sessile. Caulescent.*

++ *Calyx-teeth very slender, exceeding the tube. Low, from a woody caudex: the stipules all more or less connate.*

54. **A. pauciflorus,** Hook. Dwarf, *cinereous-pubescent,* matted-decumbent, with crowded leaves: leaflets 3 to 5 pairs, *oblong or lanceolate: peduncles 2 to 5-flowered: corolla violet: pod linear-oblong, silky-puberulent, 4 to 5 lines long.* — From the head-waters of the Yellowstone northward in the mountains of British America.

55. **A. tegetarius,** Watson. Dwarf, cespitose, *canescent with a silky pubescence:* stems 2 to 6 lines long, numerous, procumbent: leaflets 3 to 5 pairs, *linear: peduncles 1 to 3-flowered: corolla ochroleucous:* pod *ovate-oblong, pubescent, 2 to 3 lines long.* — Bot. King's Exp. 76, t. 13. Nevada, Idaho, and Montana.

Var. **implexus,** W. M. Canby. *Leaflets in 2 pairs, crowded on the stems:* stipules tipped with a short straight point: *flowers violet, the keel deep purple: pods mostly smaller, 1 or 2 lines long.* — Fl. Colorado, Appx. South Park, Colorado.

++ ++ *Calyx-teeth short or about equalling the tube. Slender, rather rigid, branched: upper stipules nearly distinct: leaflets linear to oblong, or none: flowers in loose long-peduncled racemes, ochroleucous or purplish.*

56. **A. campestris,** Gray. *Minutely pubescent or glabrate: stipules membranous, large; leaflets 5 to 9 pairs:* flowers subcapitate or scattered, *the keel with a long and narrow inflexed tip:* pod oblong-linear, *puberulent.* — Proc. Am. Acad. vi. 229. Mountains of Colorado and northward through Montana.

57. **A decumbens,** Gray. *Cinereous- or silky-pubescent:* stems diffuse or ascending: *petioles sometimes somewhat flattened, mostly with 7 to 13 leaflets:* racemes 5 to 10-flowered: *keel with a short inflexed tip:* pod broad-linear, straight or falcate, *hoary puberulent.* — Loc. cit. Mountains of Colorado and northward.

58. **A. junceus,** Gray. *Minutely pubescent or subglabrous:* stems usually solitary, erect: *stipules small: petioles slender, sometimes 6 inches long, usually naked, or with 1 to 5 pairs of linear leaflets:* peduncles 3 to 7-flowered, flowers distant: *keel strongly incurved:* pod oblong-linear, straight or subfalcate, *pubescent.* — Loc. cit. 230. Includes *A. diversifolius,* Gray. Gravelly plains, from Colorado northward through Wyoming and Montana, and westward into Utah and Nevada.

+– +– +– *Stipules scarious, connate: pod short, sessile. Acaulescent, cespitose, silky-canescent: leaves simple, lanceolate- or spatulate-linear: scapes exceeding the leaves, many-flowered: corolla purple or rose-color.*

59. **A. cæspitosus,** Gray. Racemes spike-like: pod oblong or broad-lanceolate, scarcely curved. — Loc. cit. Plains of the Platte from W. Nebraska to the mountains.

* * *Cushioned: flowers scarcely exserted from among the simple leaves: pod many-ovuled, margined with rather strong sutures.*

60. **A. simplicifolius,** Gray. Leaves hoary with an appressed silky pubescence, linear- or spatulate-lanceolate, crowding the extremities of the usually short branches: scapes 2 to 3-flowered: flowers purple, the keel strongly arched: pod half-included in the calyx, glabrous. — Loc. cit. 231. Sources of the Platte. W. Wyoming (*Parry*).

* * * *Caulescent, often depressed: flowers subsessile in the axils of the leaves: pods 3 to 4-ovuled, usually 1-seeded, ovate, sessile: leaves pinnate, with few leaflets*

61. **A. Kentrophyta,** Gray. Intricately branched from a long root, broadly depressed-cespitose, hoary with a short silky pubescence: leaflets 2 to 3 pairs, linear-subulate, usually rigid and divaricate, pungent: flowers 1 to 3, ochroleucous or tinged with violet: pods compressed, pubescent, acuminate, somewhat incurved. — Proc. Acad. Philad. 1863, 60. From Montana and Wyoming to New Mexico and westward into Nevada.

B. *Leaves apparently palmately 3-foliolate.*

§ 21. *Pod conical-ovate, acuminate, not stipitate nor compressed, coriaceous, somewhat included in the calyx, neither suture intruded. — Perennial, cespitose from a much-branched woody caudex, low, silvery-silky, with crowded leaves: leaflets crowded.*

62. **A. triphyllus,** Pursh. Acaulescent, *glossy silky: stipules glabrous:* primary leaves sometimes 5-foliolate with cuneate oblanceolate leaflets, the rest with 3 longer lanceolate leaflets, long-petioled, *exceeding the sessile crowded flowers: calyx-teeth half shorter than the tube: corolla ochroleucous or white: pod villous, included.* — From Nebraska to the Saskatchewan.

63. **A. tridactylicus,** Gray. Resembling the last in habit and leaves, but *stipules villous, flowers pale purple, calyx-teeth equalling the tube, pod puberulent, exposed by the falling away of the calyx.* — Proc. Am. Acad. vi. 527. Mountains of Colorado.

64. **A. sericoleucus,** Gray. Very broadly cespitose, *silky-hoary:* the branches covered with *villous stipules:* leaves all 3-foliolate, *not equalling the* 2 *to* 6 *flowered filiform peduncles;* leaflets oblanceolate or cuneate-oblong: *calyx-teeth about equalling the tube: corolla purple: pod hoary, half included in the calyx.* — Am. Jour. Sci. II. xxxiii. 410. From the sand-hills of N. Colorado to N. Nebraska.

14. OXYTROPIS, DC.

Like *Astragalus,* but distinguished by a subulate beak at the tip of the keel. — Mostly low perennials, with tufts of numerous very short stems from a hard and thick root or rootstock, covered with scaly adnate stipules: pinnate leaves of many leaflets: naked scapes bearing a head or short spike of flowers. — Rev. Oxyt., Gray in Proc. Amer. Acad. xx.

§ 1. *Stipules free from the petiole and from each other: leafy-stemmed or depauperate plants nearly stemless.*

1. **O. deflexa,** DC. Loosely soft-pubescent or silky: taller forms over a foot high: leaflets crowded in 12 to 16 pairs, lanceolate to oblong, ¼ to ½ inch

long: peduncles much surpassing the leaves: flowers rather small (about ¼ inch long), in a short and close or in fruit lengthened and open spike: pod oblong-lanceolate, not stipitate, 1-celled, much surpassing the calyx. — In the mountains from British America to S. Colorado and westward to Utah. Subalpine forms are often depauperate and almost stemless.

§ 2. *Stipules adnate to the petiole, imbricated on the short branches of the caudex which bears the scapes and leaves: no other ascending stems.*

* *Most of the numerous leaflets as if verticillate or fascicled in threes or fours or more along the rachis: scape spicately several to many-flowered: pod ovate, 2-celled, hardly surpassing the very villous calyx.*

2. **O. splendens,** Dougl. Silvery silky-villous, 6 to 12 inches high: flowers erect-spreading: pod erect. — Whole length of the Rocky Mountains, and plains along their eastern base, to the Saskatchewan.

* * *Leaflets simply pinnate.*

+ *Pod wholly enclosed in the bladdery ovate-globose calyx, turgid-ovate, one-celled: peduncles weak, 1 to 2-flowered.*

3. **O. multiceps,** Nutt. Matted cespitose, subcaulescent, 1 to 3 inches high, canescently silky: leaflets 3 to 4 pairs: flowers purple: pod short-stipitate. — Alpine region of the Rocky Mountains, S. Wyoming and Colorado. Nuttall's specimens are larger-leaved and less cespitose than those of subsequent collectors distributed as var. *minor*, Gray.

+ + *Pod nearly or quite enclosed in and completely filling the distended and often split fructiferous calyx, turgid, pubescent, half two-celled: scapes capitately few to several-flowered, surpassing the leaves, a span high: flowers over ½ inch long.*

4. **O. nana,** Nutt. *Silvery with appressed silky pubescence:* leaflets 3 or 4 or rarely 6 pairs, *narrowly lanceolate: flowers purple* or whitish: pod turgid-oblong, *somewhat coriaceous*, the *acuminate tip* barely projecting out of the *undivided* lightly villous *calyx*. — Torr. & Gray, Fl. May be *O. argentea*, Pursh, Fl. ii. 473. Mountains of Wyoming and Montana.

5. **O. lagopus,** Nutt. *White silky with looser and more villous hairs:* leaflets 4 or 5 pairs, *lanceolate or oblong: flowers bright violet:* pod ovate, *thin-membranaceous* and almost bladdery, *obtuse*, abruptly tipped with the persistent style, slightly surpassing the calyx *which soon splits down one side.* — Jour Acad. Philad. vii. 17. Mountains of Wyoming and Montana.

+ + + *Pod well surpassing the calyx; this at length split down one side or remaining unchanged.*

++ *Bladdery-inflated and membranaceous, ovate, one-celled: scapes or peduncles few-flowered, in fruit usually decumbent: very low and depressed-tufted plants.*

6. **O. podocarpa,** Gray. *Villous*, or in age glabrate: *leaflets 5 to 11 pairs, linear-lanceolate* (3 or 4 lines long): *peduncles 2-flowered, not surpassing the leaves:* flowers comparatively large (7 or 8 lines long), violet: *pod large* (often an inch long), broadly ovate, *puberulent, short-stipitate, neither suture at all introflexed.* — Proc. Am. Acad. vi. 234. *O. Hallii*, Bunge. Alpine and subalpine, from S. Colorado to British America and perhaps to the Arctic regions.

7. **O. oreophila,** Gray. *Silky-canescent: leaflets 3 to 5 pairs, lanceolate to oblong* (2 to 4 lines long): *scapes commonly surpassing the leaves, capitately 4 to*

8-*flowered:* flowers only 4 or 5 lines long, apparently purple: *pod hardly ½ inch long*, oblong-ovate, *cinereous-pubescent, not at all stipitate, the ventral suture moderately introflexed.* — Proc. Am. Acad. xx. 3. A species of S. California and Utah, collected on Aquarius Plateau, Utah, by *L. F. Ward;* probably to be found within our southwestern boundaries.

++ ++ *Pod oblong or narrower, not bladdery-inflated, coriaceous, nearly or quite 2-celled: scape 1 to 3-flowered.*

8. **O. Parryi,** Gray. Silky-canescent: leaves and scapes about a span high: leaflets 7 to 9 pairs, oblong-lanceolate (2 or 3 lines long): calyx short, cinereous-pubescent: pod nearly ½ inch long, terete with a strong ventral groove, grayish-pubescent, not at all stipitate. — Proc. Am. Acad. xx. 4. *O. arctica* of Hall & Harbour's collection, no. 143. *O. Uralensis*, var. *pumila*, of Western Reports. Mountains of Colorado near the limit of trees.

++ ++ ++ *Pod nearly terete, turgid, but not bladdery-membranaceous, not stipitate or rarely obscurely so: scape capitately or spicately several to many-flowered.*

= *More or less glandular viscid, at least the calyx and commonly the pod.*

9. **O. viscida,** Nutt. Leaflets numerous and small (2 to 4 lines long), thickish, oval or oblong, often pubescent when young, at maturity green and glabrate: flowers in a dense oblong head or at length in a short spike, less than ½ inch long: calyx villous and with sessile glands usually evident: pod small (3 to 5 lines long), puberulent, oblong, thin-chartaceous, half 2-celled, the small beak or point straight. — Torr. & Gray, Fl. i. 341. In the mountains from British America to Colorado; common in Wyoming.

= = *Not glandular nor viscid: leaves more or less silky at least when young.*

10. **O. monticola,** Gray. Loosely silky-villous, at least the scapes (5 to 9 inches high) and calyx: leaflets sometimes glabrate, oblong or lanceolate (3 to 7 lines long): *spike oblong or cylindraceous, dense even in fruit: flower hardly ½ inch long:* pod ovate-oblong, *between membranaceous and chartaceous,* ⅛ to ¼ inch long, tipped with a straight point, *one-celled* with no introflexion of the ventral suture, or nearly half 2-celled, *silky-canescent.* — Proc. Am. Acad. xx. 6. *O. campestris* of Hook. Fl. Bor. Am. in part. Mountains of Wyoming, Dakota, and northward.

11. **O. Lamberti,** Pursh. *Commonly taller as well as larger* (the scapes often a foot or more high), silky- and mostly silvery-pubescent, sometimes glabrate in age: leaflets from oblong-lanceolate to linear (4 to 16 lines long): *spike sometimes short-oblong and densely flowered* at least when young, *often elongated and sparsely flowered: flowers mostly large* (often an inch long, but sometimes much smaller), variously colored: pod either narrowly or broadly oblong, *sericeous pubescent, firm-coriaceous,* ½ inch or more long, *imperfectly 2-celled.* — Includes *O. campestris* of Hook. Fl. Bor. Am. in part. Common along the Great Plains from the Saskatchewan and Minnesota to New Mexico, Texas, etc., and in the foothills.

Var. **sericea,** Gray, is a robust mountain form, canescent with the silky pubescence; the leaflets mostly broad (3 or 4 lines), and the cylindraceous pods nearly or quite an inch long. — *O. sericea*, Nutt. in Torr. & Gray, Fl. i. 339.

Var. **Bigelovii,** Gray, is a marked form, with pods of the preceding form, but more slender, of thinner texture, and short-stipitate; leaflets green

and glabrate, narrow. — The *O. Lamberti* of Torr. in Pacif. R. Rep. iv. 80. On the Upper Canadian River, Colorado, *Bigelow.*

15. HEDYSARUM, Tourn.

Keel nearly straight, obliquely truncate, not appendaged, longer than the wings. Pod flattened, the separable joints roundish and equal-sided. — Perennial herbs.

1. **H. Mackenzii,** Richard. Stems 2 feet high, minutely pubescent, simple or branched: leaflets 11 to 17 (usually 11), *canescently pubescent,* nearly glabrous above: *racemes loosely 7 to 30-flowered, elongating in fruit*: flowers large, light purple: *pod 2 to 4-jointed, minutely pubescent.* — From Colorado northward to the Arctic regions.

2. **H. boreale,** Nutt. Leaflets 13 to 21, *nearly glabrous: raceme of many deflexed purple flowers: pod 3 or 4-jointed, smooth, reticulated.* — From W. Wyoming (*Parry*) northward throughout British America to the Arctic Circle.

16. VICIA, Tourn. Vetch. Tare.

Wings adherent to the middle of the short keel. Style inflexed. Pod flat, smooth. Seeds globular. — Herbs, with angular stems, more or less climbing: leaflets entire or toothed at the apex: stipules semi-sagittate: flowers solitary or in loose peduncled axillary racemes.

* *Perennial: peduncles 4 to 8-flowered.*

1. **V. Americana,** Muhl. Usually rather stout, 1 to 4 feet high, glabrous: leaflets 4 to 8 pairs, very variable, linear to ovate-oblong, truncate to acute: peduncles 4 to 8-flowered: flowers purplish: pod oblong, 3 to 6-seeded. — Throughout the whole of our range and extending to Washington Territory and New Mexico and eastward across the continent.

Var. **truncata,** Brewer. Usually somewhat pubescent: *leaflets truncate* and often 3 to 5-toothed at the apex. — Bot. Calif. i. 158. *V. truncata,* Nutt. From Colorado and northwestward to Washington Territory.

Var. **linearis,** Watson. *Leaves all linear.* — Proc. Am. Acad. xi. 134. *Lathyrus linearis,* Nutt. From the Rocky Mountains westward to California, being the common western form of the species.

* * *Slender annuals: peduncles 1 or 2-flowered.*

2. **V. exigua,** Nutt. A span to two feet high, *more or less pubescent: leaflets about 4 pairs, linear, acute:* peduncles rarely 2-flowered: flowers purplish: *pod linear-oblong.* — Torr. & Gray, Fl. i. 272. S. Colorado and New Mexico, westward to California.

3. **V. micrantha,** Nutt. Stem 2 to 3 feet long, strongly angled, *glabrous,* climbing: leaflets 2 to 6 pairs (*usually 2 pairs*), *oblong-elliptical, obovate or linear-oblong, obtuse or emarginate,* mucronate: peduncles at first much shorter than the leaves: flowers pale, blue at the tip: *pod sabre-shaped,* sessile. — Loc. cit. 271. From Colorado to Texas and Louisiana.

17. LATHYRUS, L. Everlasting Pea.

Nearly as in *Vicia* except the characters given in the synopsis of genera. All of ours have long peduncles. — Watson, Proc. Am. Acad. xi. 133.

§ 1. *Rachis of the leaves tendril-bearing: pod sessile. Ours are perennials, with semi-sagittate stipules having lanceolate lobes, and purple or purplish flowers.*

* *Leaflets* 8 *to* 12: *peduncles rather many-flowered.*

1. **L. venosus,** Muhl. Stout, climbing, usually somewhat downy: leaflets oblong-ovate, mostly obtuse: calyx densely pubescent to nearly glabrous: pod smooth. — Throughout the Eastern States and extending northwestward to Washington Territory.

* * *Leaflets* 4 *to* 8: *peduncles* 2 *to* 6-*flowered.*

2. **L. paluster,** L. Slender, glabrous or somewhat pubescent: stem often winged: *leaflets narrowly oblong to linear:* flowers smaller (6 lines long). — Common everywhere throughout the northern portions of both hemispheres.

Var. **myrtifolius,** Gray. Stipules usually broader and larger; *leaflets ovate to oblong,* shorter (an inch long or less). — Pl. Fendl. 30. *L. myrtifolius,* Muhl. *L. venosus,* var. δ, Torr. & Gray, Fl. i. 274. *L. polyphyllus,* Watson, Bot. King's Exp. 78. The *L. pubescens,* Nutt., of Fl. Colorado. With the species.

§ 2. *Rachis not tendril-bearing or rarely so: pod shortly stipitate. In ours the peduncles are* 2 *to* 6-*flowered.*

3. **L. polymorphus,** Nutt. Usually low, finely pubescent or glabrous, glaucous: leaflets 6 to 12, thick and strongly nerved, narrowly oblong, acute: flowers very large, purple: pod 3 or 4 lines broad; funiculus remarkably narrow and hilum short. — Colorado and New Mexico to Central Arizona.

4. **L. ornatus,** Nutt. Resembling the last except the leaves are narrower and shorter, the pod somewhat broader, and the funiculus broader. — Torr. & Gray, Fl. i. 277. Mountains of Colorado and Utah.

18. CASSIA, L. Senna.

Calyx-tube very short. Anthers erect, opening by two pores or chinks at the apex. Pod usually curved, many-seeded, often with cross-partitions between the seeds. — Herbs, with flowers in terminal or axillary (in ours) clusters.

1. **C. Chamæcrista,** L. Leaflets small, somewhat sensitive to the touch, 10 to 15 pairs, linear-oblong, oblique at the base, a cup-shaped gland beneath the lowest pair: flowers on slender pedicels, in small clusters above the axils, 2 or 3 of the showy petals often with a purple spot at the base: four of the anthers yellow, the others purple. — Throughout the Eastern States and westward across the plains to Colorado.

19. HOFFMANSEGGIA, Cav.

Sepals united into a short obconic base. Petals obovate, on short claws, spreading, one or more of them often glandular at base. Filaments thickened or dilated toward the base. Pod oblong or linear, often falcate, compressed, dry, 2-valved. — Low perennial herbs or suffrutescent plants, often dotted with black glands.

1. **H. Jamesii,** Torr. & Gray. *Canescently-pubescent,* much branched from a shrubby base: pinnæ 5, abruptly 10 to 16-foliolate: *leaflets oval,* nearly

glabrous above: flowers nodding or reflexed: *the upper petal smallest, marked with reddish spots:* pod 1 inch long, *more or less lunate, scabrous, 2 to 3-seeded, sprinkled (as well as the leaves, calyx, and petals) with sessile black glands.*— Fl. i. 393. Plains of E. Colorado, New Mexico, and Texas.

2. **H. drepanocarpa,** Gray. *Minutely cinereous-puberulent, wholly destitute of glands:* stems numerous, from a thick woody root: pinnæ 5 to 11, 8 to 20-foliolate; *leaflets crowded, subfalcate,* nerveless: petals broadly obovate, *nearly alike, naked and glabrous:* pod 1½ to 2 inches long, *strongly falcate, glabrous* or minutely puberulent under a lens, 9 *to* 10-*seeded.* — Pl. Wright. i. 58. Colorado, New Mexico, and Arizona.

20. SCHRANKIA, Willd. Sensitive Briar.

Flowers polygamous. Calyx minute, 5-toothed. Pod long and narrow, 4-valved. — Perennial herbs, the procumbent stems and petioles prickly: leaves sensitive and of many small leaflets, the axillary peduncles bearing round heads of small rose-colored flowers.

1. **S. uncinata,** Willd. Prickles hooked: partial petioles 4 to 6 pairs: leaflets elliptical, reticulated with strong veins beneath: pod oblong-linear, nearly terete. — Throughout the S. E. States and westward across the plains to Colorado and Dakota.

Order 26. ROSACEÆ. (Rose Family.)

Herbs, shrubs, or trees, with mostly alternate leaves, usually evident stipules, usually perigynous mostly numerous stamens, distinct free pistils from one to many, or coherent with each other and the calyx-tube, and anatropous seeds destitute of albumen or nearly so.

Suborder I. AMYGDALEÆ.

Carpels solitary, or rarely 5, becoming drupes, entirely free from the calyx, this or its lobes deciduous. Ovules 2, pendulous, but seed almost always solitary. Style terminal. — Trees or shrubs, with bark exuding gum, and mostly (as well as the seeds) yielding the flavor of prussic acid. Stipules free, deciduous.

† 1. **Prunus.** Flowers perfect. Carpel solitary.

Suborder II. ROSACEÆ proper.

Carpels free from the persistent calyx, becoming akenes, or follicles, or drupe-like in fruit. Stipules commonly adnate to the petiole. Calyx dry and open, or sometimes strictly enclosing the fruit, or fleshy and pome-like.

Tribe I. SPIRÆACEÆ. Carpels few, rarely solitary, becoming two to several-seeded follicles. Calyx open.

* Carpels alternate with the calyx-lobes when of the same number.

† Seeds with membranous testa and no albumen: stipules none.

↔ Calyx persistent in fruit: stamens perigynous: carpels several-seeded.

2. **Spiræa.** Carpels cartilaginous, 1-valved, distinct. Flowers perfect, rarely polygamous. Leaves simple, serrate or incised.

↔ ↔ Calyx marcescent in fruit: stamens hypogynous: carpels few-seeded.

3. **Aruncus.** Carpels cartilaginous, 1-valved, distinct. Flowers diœcious. Leaves repeatedly ternately divided.

← ← Seeds with shining stony testa: albumen very distinct: stipules membranaceous, caducous.

4. **Physocarpus.** Follicles membranaceous, inflated, 2-valved, distinct, often stipitate. Flowers perfect, corymbose. Leaves lobed.

* * Carpels opposite to the calyx-lobes when of the same number.

5. **Chamæbatiaria.** Follicles coriaceous, 1-valved, connate at base, several-seeded. Albumen distinct. Flowers perfect. Leaves small, coriaceous, stipulate, bipinnately dissected.

* * * Carpel becoming an akene.

6. **Holodiscus.** Carpels alternate with the calyx-lobes, with densely silky styles and 2 collateral pendulous ovules. Akenes membranous, woolly, 1-seeded. Leaves lobed, without stipules.

Tribe II. RUBEÆ. Carpels several or numerous on a spongy receptacle, becoming drupelets in fruit. Calyx open, without bractlets. Stamens numerous. Ovules 2 and pendulous, but seed solitary.

7. **Rubus.** Carpels indefinitely numerous, berry-like in fruit. Perennial herbs or soft-woody shrubs with biennial stems.

Tribe III. POTENTILLEÆ. Carpels numerous, several, or solitary, 1-ovuled, becoming dry akenes. Calyx not enclosing or at least not constricted over the fruit. Seed erect or ascending.

* Shrubs: carpels mostly solitary: style not elongated in fruit: stigma decurrent: calyx imbricated, without bractlets. Flowers solitary in ours.

8. **Purshia.** Petals 5. Leaves 3-cleft. Radicle inferior.

9. **Coleogyne.** Calyx 4-parted, colored. Petals none. Leaves opposite, small, narrow, entire. Radicle superior.

* * Trees or shrubs: carpels solitary or numerous: styles elongated and plumose in fruit: calyx imbricated, without bractlets (except in *Fallugia*): seed erect.

10. **Cercocarpus.** Flowers solitary, axillary, small. Petals none. Carpels solitary, rarely 2. Calyx-tube long-cylindrical; the limb deciduous. Leaves simple, entire or toothed.

11. **Cowania.** Flowers solitary, short-peduncled, terminal, showy. Petals 5. Carpels 5 to 12. Calyx short and turbinate. Leaves cuneate, lobed.

12. **Fallugia.** Flowers somewhat panicled, on long peduncles, showy. Petals 5. Carpels numerous. Calyx turbinate. Leaves with linear lobes.

* * * Herbs: carpels few to many: calyx concave or campanulate, valvate in the bud, bracteolate.

← Seed erect from the base of the cell: radicle inferior: style strictly terminal, persistent.

13. **Dryas.** Like *Geum*, but petals 8 or 9.

14. **Geum.** Carpels very numerous on a dry receptacle: the elongated style in fruit mostly geniculate or plumose. Petals 5.

← ← Seed suspended or ascending: radicle superior: style small, naked, not geniculate.

15. **Fragaria.** Carpels very numerous, in fruit on a large fleshy scarlet receptacle. Styles lateral. Leaves 3-foliolate.

16. **Potentilla.** Petals yellow, rarely white, sessile. Stamens usually 20 or more; filaments narrow or filiform. Carpels mostly numerous, on a dry receptacle. Leaves pinnate or digitate; leaflets toothed or cleft, not confluent.

17. **Sibbaldia.** Petals yellow, sessile, minute and narrow. Stamens 5; filaments very short, filiform. Carpels 5 to 10, on a dry receptacle. Leaves 3-foliolate; leaflets 3-toothed.

18. **Ivesia.** Petals yellow, with claws, or spatulate. Stamens 20; filaments filiform. Carpels 1 to 15, on a dry villous receptacle. Leaves pinnate; leaflets cleft or parted, often small and very numerous and closely imbricated.
19. **Chamærhodos.** Petals white, obovate. Stamens 5; filaments short, subulate. Carpels 5 to 10, on a dry villous receptacle. Leaves many-cleft; the segments linear.

Tribe IV. POTERIEÆ. Carpels 1 to 3, in fruit akenes, completely enclosed in the dry and firm calyx-tube, the throat of which is constricted or sometimes nearly closed. Seed suspended. Ours are herbs with pinnate leaves and solitary ovule.

20. **Agrimonia.** Calyx turbinate, surrounded by a margin of hooked prickles. Petals yellow. Stamens 5 to 12. Flowers in long racemes.
21. **Poterium.** Calyx-lobes 4, imbricate, deciduous, petaloid; the tube 4-angled, naked. Petals none. Flowers in dense heads.

Tribe V. ROSEÆ. Carpels many, in fruit bony akenes, enclosed and concealed in the globose or urn-shaped fleshy calyx-tube, which resembles a pome. Petals conspicuous. Stamens numerous.

22. **Rosa.** Erect shrubs, with pinnate leaves.

Suborder III. POMEÆ.

Carpels 2 to 5, enclosed in and mostly adnate to the fleshy calyx-tube, in fruit becoming a pome. A pair of ovules in each carpel. Styles often united below. — Trees or shrubs, with stipules free from the petiole or nearly so.

23. **Cratægus.** Ovary 2 to 5-celled; the fruit drupaceous, of 2 to 5 bony 1-seeded stones, either separable or united into one. Branches usually thorny.
24. **Pyrus.** Ovary 2 to 5-celled; the fruit a proper pome, with papery or cartilaginous and undivided 2-seeded cells or carpels.
25. **Amelanchier.** Ovary 5-celled; the cells 2-ovuled and 2-seeded, but in fruit each divided into two by a partition from the back. Styles 3 to 5. Otherwise like *Pyrus.*
26. **Peraphyllum.** Ovary usually 2- (incompletely 4-) celled. Styles 2. Otherwise like *Amelanchier.*

1. PRUNUS, Tourn. Plum, Cherry, &c.

Calyx 5-cleft. Petals 5, spreading. Stamens 15 to 25, inserted with the petals. — Leaves simple, usually serrulate: flowers white, fascicled in the axils, or in terminal racemes.

* *Flowers in umbel- or corymb-like clusters from lateral scaly buds in early spring, preceding or coëtaneous with the leaves.*

1. **P. Americana,** Marshall. (Wild Yellow or Red Plum). Tree thorny, 8 to 20 feet high: *leaves ovate,* or somewhat obovate, *conspicuously pointed, coarsely or doubly serrate,* very veiny, *glabrous when mature:* fruit nearly destitute of bloom, *roundish oval, yellow, orange, or red;* the stone turgid, *more or less acute on both margins;* pleasant-tasted, but with a tough and sour skin. — Colorado. Very common throughout the East.

2. **P. Chicasa,** Michx. (Chickasaw Plum.) Stem scarcely thorny: *leaves nearly lanceolate, finely serrulate, glabrous:* fruit nearly destitute of bloom, *globular, red;* the stone ovoid, almost as thick as wide, *rounded at both sutures, one of them minutely grooved.* — Perhaps native only west of the Mississippi from Arkansas southward, but introduced eastward, and westward to Colorado.

3. **P. Pennsylvanica,** L. (Wild Red Cherry.) Tree 20 to 30 feet high, with light red-brown bark: *leaves oblong-lanceolate, pointed, finely and sharply serrate, shining, green and smooth both sides:* fruit globose, *light red,* very small, with thin and sour flesh; *stone globular.* — From Colorado northward, and eastward to Newfoundland and Virginia.

4. **P. emarginata,** Walpers, var. **mollis,** Brewer. Becoming a small tree 25 feet high, with bark like that of an ordinary Cherry-tree, *more or less woolly-pubescent: leaves oblong-ovate to lanceolate, mostly obtuse, crenately serrulate,* narrowed to a short petiole, with usually one or more glands near the base of the blade, *more or less woolly-pubescent on the under side:* fruit globose, *black,* bitter and astringent; *stone with a thick grooved ridge upon one side.* — Bot. Calif. i. 167. Bitter Root Mountains and westward into Oregon and California.

* * *Flowers in racemes terminating leafy branches, hence appearing after the leaves, late in spring.*

5 **P. demissa,** Walpers. (Wild Cherry.) An erect slender shrub 2 to 12 feet high: leaves ovate or oblong-ovate, abruptly acuminate, *mostly rounded or somewhat cordate at base,* sharply serrate, *usually more or less pubescent beneath,* with 1 or 2 glands at base: *fruit purplish-black,* or red, *sweet and edible,* but somewhat astringent; *stone globose.* — From the Rocky Mountains westward to the coast.

6. **P. Virginiana,** L. (Choke Cherry.) *Leaves rarely at all pubescent, more frequently somewhat cuneate at base: fruit dark red, very astringent and scarcely edible; the stone more ovoid and acutish:* otherwise like the last, but more diffuse in habit, and preferring stream banks and moist localities. — This species appears to be distributed throughout the whole of North America except in the region west of the Rocky Mountains.

2. SPIRÆA, L. Meadow-Sweet.

Petals 5, rounded, nearly sessile. Stamens numerous. Carpels usually 5 or more. — Perennial herbs or mostly shrubs: flowers white or rose-colored, in compound corymbs or spikes. — We follow the arrangement of Dr. Maximowicz in recognizing the four following genera as distinct from *Spiræa.* Bot. Calif. ii. 443.

* *Erect shrubs: petals rose-colored or purplish: flowers in compound corymbs.*

1. **S. betulifolia,** Pallas. Glabrous or finely pubescent, with reddish bark: leaves broadly ovate to ovate-oblong, acutely and unequally serrate or incised, on short petioles or nearly sessile: flowers pale purple, the fastigiate corymbs often leafy-bracted: ovules 5 to 8. — *S. corymbosa,* Raf. Headwaters of the Missouri, eastward in the Alleghany Mountains, westward to N. California, and northward to Alaska.

Var. **rosea,** Gray. Corolla rose-red. — Proc. Am. Acad. viii. 381. W. Wyoming, Idaho, and westward to Oregon and California.

* * *Low herbaceous perennials, woody at base: petals white: flowers in dense cylindrical spikes on scape-like stems.*

2. **S. cæspitosa,** Nutt. Cespitose, on rocks: leaves rosulate on the short tufted branches of the woody spreading rootstock, oblanceolate or linear-

spatulate, silky on both sides; those of the scape scattered and narrower: calyx-lobes silky: filaments and styles exserted: carpels 3 to 8, somewhat villous or glabrous, 2-seeded. — Torr. & Gray, Fl. i. 418. W. Wyoming to Montana and Oregon, and southward to New Mexico.

3. ARUNCUS, L. Goat's-Beard.

Herbaceous: the small white flowers in numerous filiform panicled spikes.

1. **A. sylvester,** Kost. Smooth, branching, 3 to 5 feet high: leaves large; leaflets thin, sparingly villous beneath, ovate to lanceolate, acuminate, sharply and laciniately doubly toothed, the terminal one broadest: panicle large and compound, pubescent: filaments long-exserted: carpels 3 to 5, smooth. — *Spiræa Aruncus,* L. Ranges across the continent.

4. PHYSOCARPUS, Maxim. Nine-Bark.

Carpels 1 to 5, divergent. Ovules 2 to several. — Diffuse shrubs: flowers large, white.

1. **P. opulifolia,** Maxim. A shrub 3 to 10 feet high, with ash-colored shreddy bark: leaves ovate or often cordate, 3-lobed and toothed, on slender petioles, *nearly glabrous: flowers on long slender pedicels* in simple umbel-like hemispherical tomentose corymbs: *carpels 2 to 5, glabrous.* — *Spiræa opulifolia,* L. *Neillia opulifolia,* Benth. & Hook. From California northward to British America and eastward across the continent.

2. **P. Torreyi,** Maxim. A small shrub, differing from the last in its *smaller leaves,* its finer pubescence, and the *leaves sometimes densely white-tomentose beneath,* its *fewer and smaller flowers on short pedicels,* fewer stamens, and especially the *densely tomentose ovaries,* which are fewer (1 or 2) and become less inflated. — *Spiræa opulifolia,* var. *pauciflora,* Hook., and in Fl. Colorado var. *parvifolia. Neillia Torreyi,* Watson. In the mountains of Colorado and westward to Nevada.

5. CHAMÆBATIARIA, Maxim.

Flowers large, white, in a leafy terminal racemose panicle. — A stout, diffusely branched, glandular-pubescent shrub.

1. **C. Millefolium,** Maxim. More or less tomentose: leaves narrowly lanceolate in outline, scattered or fascicled at the ends of the branches, with very numerous (about 20) pinnæ and minute oblong obtuse leaflets (about 6 pairs): the erect acute lobes of the calyx nearly equalling the orbicular petals: carpels 5, pubescent. — *Spiræa Millefolium,* Torr. Pac. R. Rep. iv. 83, t. 5. From W. Wyoming (*Coulter*) to California.

6. HOLODISCUS, Maxim.

Petals white, broadly oblong, about equalling the 5-parted calyx. — A diffuse shrub, with grayish brown bark: flowers in loose spreading panicles.

1. **H. discolor,** Maxim. Pubescent, 4 feet high or more: leaves broadly ovate, truncate at base or cuneate into a slender petiole, more or less silky-

tomentose beneath, nearly smooth above, pinnatifidly toothed or lobed, the lobes often dentate: panicle much branched, tomentose. — *Spiræa discolor*, Pursh.

Var. **dumosa,** Maxim. Only 1 to 3 feet high: leaves usually small, cuneate into a short margined petiole, often white tomentose beneath: panicle mostly smaller and less diffuse. — *Spiræa dumosa*, Nutt. *S. discolor*, var. *dumosa*, Watson. Colorado and New Mexico and thence to the Sierra Nevada and Oregon.

7. RUBUS, L. Raspberry. Blackberry.

Petals 5, conspicuous. Styles nearly terminal. — Erect or trailing, often prickly: leaves simple or pinnately 3 to 7-foliolate: flowers white or reddish, in panicles or corymbs, or solitary: fruit usually edible, red, purple, or purplish-black. — Ours are all true Raspberries, having fruit with a bloom separating from the receptacle when ripe. The Blackberries, having fruit black, shining and persistent on the receptacle, are not known to occur within our range.

* *Leaves simple: prickles none (except in No. 3): flowers large: fruit and receptacle flat and broad.*

1. **R. Nutkanus,** Moçino. (Salmon-berry.) Stems 3 to 8 feet high; *bark green and smooth or more or less glandular-pubescent*, becoming brown and shreddy: leaves palmately and nearly equally 5-lobed, *cordate at base, unequally serrate*, 4 to 12 inches broad, glabrous or somewhat tomentose, *the veins beneath as well as the petioles and peduncles usually more or less hispid with gland-tipped hairs:* flowers white, an inch or two broad: calyx densely tomentose: carpels very numerous, *tomentose: fruit red*, large, and pleasantly flavored. — From Colorado northward, westward to the coast, and eastward to Upper Michigan.

2. **R. deliciosus,** James. Shrub 3 to 4 feet high; *branches, young leaves, and calyx tomentose-pubescent or puberulent, not glandular: leaves reniform-orbicular*, rugose, more or less 3 to 5-lobed, *finely serrate-toothed:* flowers 2 inches across: *sepals with a dilated acumination:* petals white: *fruit purplish*, large, *smooth*, "flavor not agreeable to the human palate." — Cañons of Colorado.

3. **R. nivalis,** Dougl.—*Low, not more than 6 inches high*, frutescent: leaves cordate, 3-lobed, *sharply toothed, glabrous, the petioles and veins of the leaves armed with recurved prickles:* peduncles short, 2-flowered: *petals red* (?): *fruit red.* — In the Bitter Root Mountains and northward. Probably a species of the next section with the leaflets confluent.

* * *Leaflets 3 to 5: petals small, erect, white.*

+ *Stems annual, herbaceous, not prickly: fruit of few separate grains.*

4. **R. triflorus,** Richardson. Stems ascending or trailing: leaflets 3 (or pedately 5), rhombic-ovate or ovate-lanceolate, acute at both ends, coarsely doubly serrate, thin, smooth: peduncle 1 to 3-flowered: fruit small, red. — Colorado and northward into British America and eastward to the New England and Middle States.

+ + *Stems biennial and woody, prickly: receptacle oblong: fruit hemispherical.*

5. **R. strigosus,** Michx. (Wild Red Raspberry.) Stems upright, and with the stalks, etc. *beset with stiff straight bristles*, glandular when young,

somewhat glaucous: leaflets oblong-ovate, *cut-serrate*, whitish-downy underneath, *the lateral ones sessile: petals as long as the sepals: fruit light red.* — From New Mexico and Colorado northward to British America and thence eastward to the New England and Middle States; also in Nevada.

6. **R. occidentalis,** L. (Black Raspberry. Thimbleberry.) *Glaucous all over: stems recurved, armed* like the stalks, etc. *with hooked prickles,* not bristly: leaflets 3, ovate, *coarsely doubly serrate,* whitened-downy underneath, *the lateral ones somewhat stalked: petals shorter than the sepals: fruit purple-black.* — From Oregon eastward to Missouri and thence throughout the Eastern States, especially to the north.

8. PURSHIA, DC.

Calyx funnel-shaped. Petals exceeding the calyx-lobes, yellow. Stamens about 25, in one row. Carpels sometimes 2, narrowly oblong. Fruit pubescent, attenuate at each end, exserted. — Diffusely branched: leaves mostly fascicled, cuneate: flowers terminal on the short branchlets.

1. **P. tridentata,** DC. Usually 2 to 5 (rarely 8 or 10) feet high, with brown or grayish bark; the young branches and numerous short branchlets pubescent: leaves cuneate-obovate, 3-lobed at the apex, petioled, white-tomentose beneath, greener above: calyx tomentose with some glandular hairs: petals spatulate-obovate. — Arizona and New Mexico, and northward throughout the Rocky Mountain region to the British boundary; westward to the Sierras.

9. COLEOGYNE, Torr.

Calyx with a membranaceous margin, colored within. Stamens numerous, inserted upon the base of a tubular torus which includes the ovary. Style lateral, very villous at base, twisted, exserted, persistent Fruit glabrous, included. — Diffusely branched, somewhat spinescent: leaves coriaceous: flowers terminal on the short branchlets, subtended by 1 or 2 pairs of 3-lobed bracts, yellow, showy.

1. **C. ramosissima,** Torr. The short rigid branches opposite and spinescent; bark gray: leaves approximate upon the branchlets, linear-oblanceolate, puberulent with appressed hairs attached by the middle: tube of the torus membranaceous, dilated below and narrowed to the shortly 5-toothed apex, densely white-villous within: akene somewhat compressed, the obtuse apex incurved. — Pl. Frem. 8, t. 4. From S. Colorado to Arizona and Nevada, and in California.

10. CERCOCARPUS, HBK. Mountain Mahogany.

Stamens 15 to 25, in 2 or 3 rows on the limb of the calyx. Fruit coriaceous, linear, terete, villous, included in the enlarged calyx-tube. — Leaves evergreen.

1. **C. ledifolius,** Nutt. A shrub or small tree, 6 to 15 feet high: *leaves narrowly lanceolate* with margins more or less revolute, thick-coriaceous and somewhat resinous, *entire,* more or less tomentose, but *glabrous above, acute:*

flowers sessile, tomentose: *limb of the calyx deeply toothed:* tail of the akene at length 2 or 3 inches long. — Torr. & Gray, Fl. i. 427. W. Wyoming and through the Wahsatch to the Sierras and northward.

2. **C. parvifolius,** Nutt. A shrub usually 2 to 10 feet high (sometimes 15 to 20 feet): *leaves cuneate-obovate,* less coriaceous, *serrate towards the obtuse or rounded summit, more or less silky above,* densely hoary-tomentose beneath: *flowers on short slender pedicels: limb of the calyx with short teeth:* tail of the akene often 4 inches long. — From New Mexico to Wyoming and westward to the coast.

11. COWANIA, Don. Cliff Rose.

Petals obovate, spreading. Stamens numerous, in 2 rows, inserted with the petals at the throat of the calyx-tube. Carpels densely villous. Fruit coriaceous, narrowly oblong, striate, nearly included in the dilated calyx-tube. — Leaves small, toothed or pinnatifid, coriaceous, glandular-dotted.

1. **C. Mexicana,** Don. A much branched shrub, 1 to 6 feet high; the trunk with abundant shreddy light-colored bark: leaves approximate upon the short branchlets, cuneate-obovate in outline, pinnately 3 to 7-lobed, dark green above, tomentose beneath: flowers yellow, the calyx-tube attenuate into a short glandular-hairy pedicel: tail of the akene at length 2 inches long or more. — N. Utah and S. Colorado to Central Mexico.

12. FALLUGIA, Endlicher.

Calyx-tube villous within; the 5 lobes with alternate linear bractlets. Stamens numerous, inserted in a triple row upon the margin of the calyx-tube. Carpels densely villous, inserted upon a small conical receptacle. Fruit coriaceous, narrowly oblong, exserted. — A low undershrub: leaves pinnately lobed, margin revolute: flowers white.

1. **F. paradoxa,** Endlicher. Much branched with somewhat virgate slender branches; epidermis white, persistent: leaves scattered or fascicled, somewhat villous, cuneate and attenuate into a linear base, pinnately 3 to 7-cleft above. — From Colorado to California and southward into Mexico.

13. DRYAS, L.

Calyx open, flattish, 8 to 9-parted. Petals large, white or yellowish. — Dwarf and matted slightly shrubby plants, with simple toothed leaves and solitary large flowers.

1. **D. octopetala,** L. Leaves oblong-ovate, coarsely crenate-toothed, obtuse at each end, clothed with a white tomentum beneath, the veins prominent, the margins revolute: sepals linear. — Alpine. High peaks of Colorado and northward throughout British America to Greenland.

14. GEUM, L. Avens.

Calyx-lobes usually with 5 alternate bractlets. Carpels on a conical or clavate receptacle. Akenes small, compressed. — Perennial herbs: leaves mostly radical, lyrate or pinnate; stipules adnate to the sheathing petioles: flowers rather large, solitary or corymbose.

§ 1. *Styles jointed and bent near the middle, the upper part deciduous, the lower naked and hooked, becoming elongated: calyx-lobes reflexed. — In ours the petals are golden-yellow, broadly obovate, exceeding the calyx.*

1. **G. macrophyllum,** Willd. *Bristly-hairy,* stout (1 to 3 feet high): root-leaves lyrately and interruptedly pinnate, *with the terminal leaflet very large and round heart-shaped; lateral leaflets of the stem-leaves* 2 *to* 4, *minute, the terminal roundish,* 3-*cleft, the lobes wedge-form and rounded: receptacle of the fruit nearly naked.* — From the Sierra Nevada to the Atlantic, and northward to Sitka.

2. **G. strictum,** Ait. Somewhat hairy (3 to 5 feet high): root-leaves interruptedly pinnate, *the leaflets wedge-obovate; leaflets of the stem-leaves* 3 *to* 5, *rhombic-ovate or oblong, acute: receptacle of fruit downy.* — From Colorado northward, and eastward to the Atlantic.

§ 2. *Style jointed and bent in the middle, the upper joint plumose: flowers large: calyx erect or spreading.*

3. **G. rivale,** L. Stems nearly simple: root-leaves lyrate and interruptedly pinnate; those of the stem few, 3-foliolate or 3-lobed: calyx brown purple: petals dilated-obovate, retuse, contracted into a claw, purplish orange: head of fruit stalked in the calyx. — Colorado, W. Montana, and northward; also eastward to Newfoundland.

§ 3. *Style not jointed, wholly persistent and straight: head of fruit sessile: flowers large: calyx erect or spreading. — Flowering stems simple and bearing only bracts or small leaves.*

4. **G. triflorum,** Pursh. Low, *softly-hairy:* root-leaves interruptedly pinnate; the *leaflets very numerous and crowded,* oblong wedge-form, *deeply cut-toothed: flowers* 3 *or more on long peduncles:* bractlets linear, longer than the *purple calyx,* as long as the oblong *purplish erect petals: styles very long, strongly plumose in fruit.* — In the mountains from the Sierra Nevada northward and eastward to Arctic America and Labrador.

5. **G. Rossii,** Seringe. *Slightly pubescent above:* root-leaves interruptedly pinnate, rather glabrous, minutely ciliate; leaflets ovate or cuneiform, 2 *to* 3-*lobed, incised or entire: scape* 1-*flowered:* calyx-lobes shorter than the roundish *yellow petals: styles glabrous, not exserted in fruit.* — Alpine. High peaks of Colorado and W. Montana, and northward through Arctic America.

Var. **humile,** Torr. & Gray. *More pubescent,* almost silky when young, somewhat larger: *leaflets more numerous and crowded: scape sometimes* 2-*flowered.* — Fl. i. 424. Colorado, Nevada, and northward to Unalaska.

15. FRAGARIA, Tourn. STRAWBERRY.

Petals 5, white, spreading. Stamens many in one row. — Acaulescent stoloniferous perennials: leaves palmately trifoliolate; the leaflets obovate-cuneate, coarsely toothed: flowers few, cymose upon short erect scapes.

1. **F. Virginiana,** Duchesne. *Akenes imbedded in the deeply pitted fruiting receptacle,* which usually has a narrow neck: calyx becoming erect after flowering and connivent over the hairy receptacle when sterile or unfructified: *leaflets of a firm or coriaceous texture: the hairs of the scape and especially of the pedicels silky and appressed.* — The species seems to be confined to the Atlantic States.

Var. **Illinoensis,** Gray. A coarser or larger plant, perhaps a distinct species: *the flowers more inclined to be polygamo-diœcious: the villous hairs of the scape and pedicels widely spreading.* — The common form in the mountains and extending eastward to the Atlantic States.

Var. **glauca,** Watson. Differs from the type in the *perfectly smooth and glaucous surface of the leaf.* — Bot. King's Exp. 85. In the Wahsatch and Uinta Mountains.

—2. **F. vesca,** L. *Akenes superficial on the glabrous conical or hemispherical fruiting receptacle* (not sunk in pits): calyx remaining spreading or reflexed: *hairs on the scape mostly widely spreading, on the pedicels appressed: leaflets thin,* even the upper surface strongly marked by the veins. — Throughout the United States and Arctic America.

16. POTENTILLA, L. Five-finger.

Petals 5, obcordate or broadly obovate. Styles lateral or nearly terminal, short, deciduous. Akenes small, turgid, crustaceous. — Herbaceous or rarely woody: flowers cymose, or axillary and solitary. — Watson, Proc. Am. Acad. viii. 549.

* *Styles thickened and glandular toward the base: carpels glabrous, sessile: inflorescence cymose.*

+ *Style attached below the middle of the ovary: disk thickened: stamens* 25 *to* 30: *perennial herbs with glandular-villous pubescence and pinnate leaves.*

1. **P. arguta,** Pursh. Stem erect and *stout,* 1 to 4 feet high, simple below: radical leaves 7 *to* 11 *foliolate;* leaflets rounded, ovate, or subrhomboidal, incised or doubly serrate: *cyme strict and rather close: calyx densely pubescent: stamens mostly* 30. — New Mexico and northward to N. Idaho, thence eastward to the New England States and Canada.

2. **P. glandulosa,** Lindl. Resembling the last, but usually *more slender* and branched, 1 to 2 feet high, and for the most part less pubescent: *leaflets more frequently* 5 *to* 9: *cyme panicled, with elongated branches and more slender pedicels: calyx much less tomentose: stamens usually* 25. — *P. fissa,* Nutt. In the mountains, from New Mexico and Colorado northward, and thence westward to California and Washington Territory.

+ + *Style terminal: disk not thickened: flowers small: leaves pinnate or ternate.*

++ *Annual or biennial: leaflets incisely serrate, not white-tomentose: stamens* 5 *to* 20.

3. **P. Norvegica,** L. Erect, *stout,* ½ to 2 feet high, at length dichotomous above, *hirsute: leaves ternate;* leaflets obovate or oblong-lanceolate: *cyme leafy and rather loose: calyx large:* stamens 15, rarely 20: *akenes rugose,* or nearly smooth: receptacle large, oblong. — Throughout N. America, especially northward.

4. **P. rivalis,** Nutt. *More slender,* usually diffusely branched: *pubescence softly-villous,* sometimes nearly wanting: *leaves pinnate,* with 2 pairs of closely approximate leaflets, or a single pair and the terminal leaf 3-parted; upper leaves ternate; leaflets cuneate-ovate to -lanceolate, coarsely serrate: *cymes loose, less leafy: calyx small: petals minute:* stamens 10 to 20: *akenes usually*

smooth: receptacle short. — Torr. & Gray, Fl. i. 437. From the Missouri River to the Rocky Mountains.

Var. **millegrana,** Watson. *Leaves all ternate:* stems erect or weak and ascending: akenes often small and light-colored. — Rev. Pot. 553. *P. millegrana,* Engelm. Eastern slope of the Sierras and eastward to New Mexico and the Missouri.

5. **P. supina,** L. Stems decumbent at base or erect: *pubescence scanty,* villous, spreading: *leaflets pinnately* 5 *to* 11, obovate or oblong: *cymes loose, leafy: petals equalling the sepals:* stamens 20: *akenes strongly gibbous by the thickening of the very short pedicel.* — *P. paradoxa,* Nutt. From the Missouri to New Mexico, and eastward to the Mississippi, Ohio, and the Great Lakes.

++ ++ *Herbaceous perennials, more or less white-tomentose: leaflets incisely-pinnatifid: bractlets and sepals nearly equal: stamens usually* 25.

6. **P. Pennsylvanica,** L. Silky-tomentose: leaflets 5 to 9, *white-tomentose beneath, short-pubescent and greener above,* the segments linear, *slightly or not at all revolute:* cyme fastigiate but rather open, the pedicels erect. — From Colorado and New Mexico northward, thence eastward to the New England coast and Canada.

Var. **strigosa,** Pursh. Smaller: *leaflets mostly tomentose on both surfaces, deeply pectinate-divided* or pinnatifid, *with revolute margins:* cyme short and close. — From Colorado northward, and along the Missouri.

Var. **glabrata,** Watson. *Leaves subglabrous on both sides,* the lobes of the leaflets silky-tufted at the apex. — Rev. Pot. 554. Mountains of Colorado, Nevada, and northward into British America.

* * *Styles filiform, not glandular at base: inflorescence cymose.*

+ *Style terminal: carpels glabrous: disk not thickened: stamens* 20: *herbaceous perennials, with conspicuous flowers.*

++ *Leaves pinnate* (*sometimes digitate in Nos.* 7 *and* 11): *bractlets shorter than the sepals.*

7. **P. Hippiana,** Lehm. *Densely white-tomentose and silky throughout, the upper surface of the leaves a little darker:* stems branching above into a diffuse cyme: leaves occasionally digitate in reduced alpine specimens; leaflets 5 to 11, *diminishing uniformly down the petiole,* incisely toothed at least towards the apex: carpels 10 to 30. — From New Mexico and Arizona to Nebraska and the Saskatchewan.

Var. **pulcherrima,** Watson. Leaflets 5 to 9, approximate, crowded, or digitate, *the upper surface green and pubescent or subglabrous.* — Rev. Pot. 555. *P. pulcherrima,* Lehm. In the mountains from New Mexico to British America.

8. **P. effusa,** Dougl. *Tomentose throughout with scattered villous hairs: stems diffusely branched above:* leaflets 5 to 11, *interruptedly pinnate, the alternate ones often smaller,* coarsely incised-serrate or dentate: carpels 10. — From Colorado northward into British America.

9. **P. crinita,** Gray. *Appressed silky-villous, not at all tomentose: stems decumbent:* leaflets 9 to 15, *mostly folded and falcately recurved,* coarsely serrate, *villous beneath,* scarcely so or glabrous above: carpels 25 to 30. — Pl. Fendl. 41. S. W. Colorado and New Mexico.

10. **P. Plattensis,** Nutt. Subalpine: *pubescence appressed silky-villous throughout, scanty or nearly wanting: stems decumbent: leaflets 7 to 13, usually crowded and often alternate, deeply incised-pinnatifid into 3 to 7 linear segments:* flowers few, in an open cyme: carpels 25 to 40. — Torr. & Gray, Fl i. 439. *P. diversifolia,* var. *pinnatisecta* of Bot. King's Exp. 87. Mountains of Colorado and Nevada, and in the Uintas.

11. **P. dissecta,** Pursh. Low, alpine, *more or less silky-villous, with somewhat spreading hairs, or nearly glabrous:* stems decumbent or ascending: *leaflets 5 to 7,* or rarely but 3, often glaucous, *closely pinnate,* or as frequently digitate, *the upper one incisely pinnatifid or serrate, the lowest often but trifid:* flowers few, in an open cyme: carpels 10 to 20 or more. — *P. diversifolia,* Lehm. From Colorado to California and British America. The following varieties occur with the type.

Var. **glaucophylla,** Lehm. *Glaucous-green:* leaves digitate, *nearly glabrous on both sides.*

Var. **multisecta,** Watson. *Canescent with a not very dense silky pubescence:* leaves digitate or nearly so, *the leaflets digitately or pinnately divided and the segments linear.* — Bot. King's Exp. 86.

Var. (?) **decurrens,** Watson. *Leaflets but* 3 or with 1 to 2 additional distant pairs of smaller ones, *the terminal leaflet truncately 3-toothed, the upper pair* 2 to 3-toothed, *conspicuously decurrent: stem 1-flowered, 3 inches high, glabrous throughout,* excepting the villous calyx and tufted apices of the leaves. — Rev. Pot. 557. From peaks of the Uintas.

++ ++ *Leaves digitately 5 to 7-foliolate (rarely pinnate in No. 12): tomentose or villous.*

12. **P. gracilis,** Dougl. *Villous and more or less tomentose: stems 2 to 3 feet high: leaflets mostly 7, incisely serrate or pinnatifid,* tomentose beneath, green above and subvillous or appressed silky: *carpels 40 or more.* — From New Mexico to Utah and California, and thence northward to the Saskatchewan and Alaska.

Var. **flabelliformis,** Torr. & Gray. *Leaflets very deeply pinnatifid.* — Fl. i. 440.

Var. **fastigiata,** Watson. *Cyme shorter and more compact,* more densely pubescent: often low. — Rev. Pot. 557. *P. fastigiata,* Nutt.

Var. **rigida,** Watson. *Villous, but without tomentum:* usually tall and stout. — Loc. cit. *P. Nuttallii,* Lehm.

13. **P. humifusa,** Nutt. *Densely white-tomentose and silky-villous:* stems decumbent, 2 *to* 4 *inches long,* slender: *leaflets* 5, green and appressed silky above, *only the rounded or truncate apex serrate with 3 to 5 teeth: carpels 15 to 20.* — From the mountains of Colorado to the Saskatchewan.

++ ++ ++ *Leaves ternate: low, arctic or alpine, few-flowered.*

14. **P. nivea,** L. Pubescence silky-villous, densely white-tomentose on the under side of the leaves: leaflets coarsely incised-serrate or pinnatifid, the terminal one sessile or petiolulate: carpels few or many. — From Colorado northward.

Var. **dissecta,** Watson. Leaves digitately or pinnately 5-foliolate, the leaflets deeply pinnatifid: stems 1 to 2 inches high, 1 to 3-flowered. — Rev. Pot. 559. In the Uintas and mountains of Montana and British America.

+– +– *Style attached below the middle of the ovary: carpels on short pedicels, and, with the receptacle, densely villous: disk not thickened: more or less woody perennials.*

15. **P. fruticosa,** L. Shrubby, much branched, 1 to 4 feet high: pubescence silky-villous: leaves pinnate; leaflets 5 to 7, crowded, oblong-lanceolate, entire, usually white beneath and the margins revolute. — From Colorado westward to N. California, northward to the Arctic Circle, and eastward to New Jersey and Labrador.

* * * *Styles filiform, attached to the middle of the ovary: peduncles axillary, solitary, 1-flowered: carpels glabrous: stems creeping or decumbent: herbaceous perennials.*

16. **P. Anserina,** L. Spreading by slender many-jointed runners, white-tomentose and silky-villous: leaves all radical, pinnate; leaflets 7 to 21, with smaller ones interposed, sharply serrate, silky-tomentose at least beneath. — From California, New Mexico, Illinois, and Pennsylvania northward to the Arctic Ocean and Greenland.

17. SIBBALDIA, L.

Petals linear-oblong. Styles lateral. — Dwarf and cespitose arctic or alpine perennials: leaves thick; the leaflets few-toothed at the truncate summit: flowers cymose.

1. **S. procumbens,** L. Somewhat villous: stems creeping, leafy at the extremities: leaflets cuneate: peduncles usually shorter than the leaves: akenes on very short hairy stipes. — Mountains of Colorado and California, and the White Mountains, and northward to Alaska and Greenland.

18. IVESIA, Torr. & Gray.

Calyx campanulate. Akenes fixed by the middle. — Herbaceous perennials: flowers in cymes or open panicles.

1. **I. Gordoni,** Torr. & Gray. Viscid-pubescent or often somewhat hirsute, or glabrate: stems 3 to 10 inches high from a thick resinous caudex: leaflets obovate, with oblong or spatulate segments; cauline leaves one or two, pinnatifid. — Pac. R. Rep. vi. 72. Wyoming, Utah, Arizona, and westward to California.

19. CHAMÆRHODOS, Bunge.

Calyx campanulate, deeply 5-cleft; the base lined with a membranous disk, which is very densely bearded at the margin. Stamens opposite the petals, inserted with them into the sinuses of the calyx above the disk. Styles arising near the base of the ovaries. — Small, erect and branching glandular-pubescent herbs: inflorescence dichotomously cymose.

1. **C. erecta,** Bunge. Stem slender, two inches to a foot high, paniculately branched above: radical leaves rosulate, ternately or biternately many-cleft; the upper cauline ones 3 to 5-cleft. — Colorado and northward into British America.

20. AGRIMONIA, Tourn. Agrimony.

Tall perennial herbs: leaves interruptedly pinnate: flowers in slender spicate racemes, with 3-cleft bracts: fruit pendulous.

1. **A. Eupatoria,** L. Leaflets 5 to 7, with minute ones intermixed, oblong-obovate, coarsely toothed: petals twice the length of the calyx. — Colorado; common throughout the Eastern States.

21. POTERIUM, L. Burnet.

Stamens 2 to 4 or more: filaments often elongated. — Ours is an annual: leaflets deeply pinnatifid, petiolulate: flowers small, perfect in ours.

1. **P. annuum,** Nutt. Glabrous, slender, 6 to 15 inches high: leaflets 4 to 6 pairs, ovate to oblong, with linear segments: flowers greenish, the heads ovoid or oblong: fruit shorter than the bracts. — From the Upper Missouri southward into the Indian Territory; also in California and Washington Territory.

22. ROSA, Tourn. Rose.

Calyx without bractlets. Stamens on the thick margin of the silky disk, which nearly closes the mouth of the calyx. Ovaries several, hairy. — Usually prickly: leaves with mostly serrate leaflets: flowers corymbose or solitary, showy. Watson, Proc. Am. Acad. xx. 324.

* *Sepals connivent and persistent after flowering.*

+– *No infrastipular spines; acicular prickles often present: fruit globose.*

1. **R. blanda,** Ait. Stems 1 to 3 feet high, *with usually few prickles or none: stipules dilated,* naked and entire, or slightly glandular-toothed; leaflets 5 or 7 (rarely 9), *cuneate at base and shortly petiolulate, simply* and coarsely *toothed,* glabrous above, paler and glabrous or more or less pubescent beneath, *not resinous: flowers corymbose or solitary: sepals entire, hispid.* — *R. fraxinifolia,* Gmelin. Within our range at its northeastern boundary, and extending from thence to Newfoundland.

2. **R. Sayi,** Schwein. Stems 1 or 2 feet high, *thickly covered with prickles: stipules dilated,* glandular-ciliate and resinous; leaflets 3 to 7, *usually sessile and obtuse or subcordate at base, more or less doubly toothed,* glabrous or slightly pubescent above, *resinous beneath: flowers solitary* (rarely 2 or 3): *outer sepals with lateral lobes, not hispid.* — Abundant in the mountains from Colorado to British America, thence eastward to Lake Superior.

3. **R. Arkansana,** Porter. Stems ½ to 6 feet high, more or less *densely prickly: stipules narrow,* more or less glandular-toothed; *leaflets* 7 *to* 11, *nearly sessile or often petiolulate, somewhat cuneate at base, simply* and coarsely *toothed,* glabrous or more or less pubescent beneath, usually *not resinous: flowers corymbose: outer sepals with one or more lateral lobes,* usually *not hispid.* — Fl. Colorado, 38. *R. blanda,* var. *setigera,* Crepin. Abundant in the mountains from New Mexico and W. Texas to British America, and eastward to the Upper Mississippi.

+– +– *Infrastipular spines present, often with scattered prickles: leaflets* 5 *or* 7.

+– *Sepals entire.*

4. **R. Nutkana,** Presl. Stems stout, 1 to 4 feet high, armed with stout straight or recurved spines: *stipules dilated, glandular-ciliate; leaflets rounded at base,* usually resinous beneath, *the teeth more or less glandular-serrulate: flowers solitary* (rarely 2 or 3), 2 *or* 3 *inches broad:* fruit globose, 6 *lines broad.* — From N. Utah (in the Wahsatch) and Idaho to Oregon and northward. Unarmed forms and others with slender spines are reported from W. Montana (*Watson*).

5. **R. Fendleri,** Crepin. Stems often tall (6 or 8 feet high, or less), with rather slender straight or recurved spines: *stipules mostly narrow and usually naked; leaflets cuneate at base* and often petiolulate, usually glaucous, finely pubescent beneath or glabrous or somewhat resinous, *the teeth usually simple: flowers smaller, corymbose or often solitary:* fruit globose, 4 *lines broad.* — From W. Texas and New Mexico to the Sierra Nevada, and northward into British America.

+– +– *Outer sepals laterally lobed.*

6. **R. Woodsii,** Lindl. Stems ¼ to 3 feet high, with slender straight or recurved spines: stipules narrow or dilated, entire; leaflets obtuse or usually cuneate at base, glabrous or pubescent above, villous or pubescent or glabrous beneath, simply toothed or resinous and serrulate-toothed: flowers corymbose or solitary, 1½ to 2 inches broad, on very short naked pedicels: fruit globose, 4 or 5 lines broad. — From Missouri and Colorado to W. Montana and the Saskatchewan. On the plains and in the valleys.

* * *Sepals spreading after flowering and deciduous: infrastipular spines present.*

7. **R. gymnocarpa,** Nutt. Stem slender and weak, 2 to 10 feet high, with straight slender spines: stipules narrow, glandular-ciliate; leaflets 5 to 9, glabrous, doubly glandular-toothed, sessile or nearly so: flowers solitary or few: sepals 3 or 4 (rarely 6) lines long, entire, deciduous (with the few distinct styles) from the very contracted top of the naked oblong-obovate to globose fruit. — In the Pacific States, but extending eastward into N. W. Montana and N. Idaho.

23. CRATÆGUS, L. Thorn.

Calyx-tube pitcher-shaped; the limb 5-parted. Petals 5, spreading. Stamens 5 to 20. — Shrubs or small trees: leaves simple, toothed, or lobed: flowers corymbose, mostly white.

1. **C. rivularis,** Nutt. Spines few, short and stout: leaves rather rigid, lanceolate-ovate, simply serrate, only the upper ones of the shoots broader, doubly serrate or rarely slightly incised; with narrow, glandular-incised stipules: calyx-lobes usually glandular: fruit black: nutlets 3 lines long or over, usually strongly ridged on the back. — Torr. & Gray, Fl. i. 464. Mountains of Colorado and Utah, and westward to the Pacific.

+– C. Douglasii, Lindl., with broader, thinner, doubly serrate leaves, broad stipules, and smaller black-purple fruit, is reported from Montana, but probably occurs only west of our range.

C. COCCINEA, L., with bright coral-red fruit, and glabrous throughout, has been reported from S. W. Colorado.

C. TOMENTOSA, L., var. PUNCTATA, Gray, with fruit dull red and yellowish with whitish dots, and leaves villous-pubescent when young, has been reported from Weber River Valley, Utah.

The last two species, belonging to the section ERYTHROCARPA, are very common east, but their occurrence within our range is so doubtful that for the present they are excluded.

24. PYRUS, L. PEAR, APPLE, &c.

Calyx pitcher-shaped or turbinate; limb 5-cleft. Petals 5, spreading, sessile or unguiculate. Stamens 20. Styles distinct, woolly at base. — Ours is a shrub, with pinnate, serrate, deciduous leaves, and white flowers in flat compound cymes.

1. **P. sambucifolia,** Cham. & Schlecht. A shrub 4 to 8 feet high, nearly glabrous: the leaf-buds and inflorescence usually sparingly villous: leaflets 4 to 6 pairs, oblong, acute: fruit berry-like, red. — From Colorado to California, northward into British America and thence eastward to the Atlantic.

25. AMELANCHIER, Medicus. JUNE-BERRY. SERVICE-BERRY.

Calyx-tube campanulate; the limb 5-parted. Petals 5, oblong, ascending. Stamens 20, short. — Shrubs or small trees: leaves simple, serrate: flowers white, racemose: fruit purplish, edible.

1. **A. alnifolia,** Nutt. A shrub 3 to 8 feet high, glabrous throughout or often more or less woolly-pubescent: leaves broadly ovate or rounded, occasionally oblong-ovate, often somewhat cordate at base, serrate usually only towards the summit: petals narrowly oblong. — *A. Canadensis*, var. *alnifolia*, Torr. & Gray. From the Rocky Mountains to California, and eastward into the Mississippi Valley.

26. PERAPHYLLUM, Nutt.

Flowers solitary or in sessile 2 to 3-flowered corymbs; petals orbicular, spreading.

1. **P. ramosissimum,** Nutt. A shrub 2 to 6 feet high, very much branched, with grayish bark and short rigid branchlets: leaves narrowly oblanceolate, attenuate into a very short petiole, somewhat silky-pubescent, sparingly denticulate: flowers appearing with the leaves, pale rose-color: styles elongated, tomentose: fruit globose, fleshy and edible. — Torr. & Gray, Fl. i. 474. S. W. Colorado to Utah, California, and Oregon.

ORDER 27. SAXIFRAGACEÆ. (SAXIFRAGE FAMILY.)

Herbs, shrubs, or sometimes small trees, distinguished from most *Rosaceæ* by albuminous seeds and small embryo; usually by definite stamens, not more than twice the number of the calyx-lobes; commonly

by the want of stipules; sometimes by the leaves being opposite; and in most by the partial or complete union of the 2 to 5 carpels into a compound ovary, with either axile or parietal placentæ. Seeds usually indefinitely numerous. Petals and stamens perigynous. Styles inclined to be distinct.

Tribe I. Herbs. Leaves mostly alternate and without distinct stipules. Styles or tips of the carpels distinct and soon divergent. Fruit capsular. — SAXIFRAGEÆ.

* Ovary with 2 or rarely more cells and placentæ in the axis, or of as many distinct carpels.

1. **Saxifraga.** Stamens 10 (rarely more). Petals 5. Calyx-tube mostly free.
2. **Boykinia.** Stamens 5. Petals 5. Calyx-tube adnate to the ovary.

* * Ovary 1-celled, with 2 or 3 parietal placentæ alternate with the styles or stigmas: no sterile filaments.

3. **Tellima.** Stamens 10, included. Petals 3 to 7-parted into narrow divisions, conspicuous. Styles 2 or 3, very short.
4. **Tiarella.** Stamens 10, and styles 2, both long, filiform and exserted. Petals entire, inconspicuous and almost filiform. Capsule very unequally 2-valved to the base.
5. **Mitella.** Stamens 5 (in ours), very short. Petals pinnatifid or 3-cleft into capillary divisions. Styles very short. Capsule depressed.
6. **Chrysosplenium.** Stamens 8 or 10, very short. Petals none. Styles 2. Capsule obcordate, flattened.
7. **Heuchera.** Stamens 5, and styles 2, both commonly slender. Petals entire, small, sometimes minute or none. Capsule ovate, 2-beaked, fully half inferior.

* * * Ovary 1-celled, with 3 or 4 parietal placentæ directly under as many obtuse sessile stigmas: a cluster of united sterile filaments alternate with the stamens.

8. **Parnassia.** Calyx 5-parted. Petals 5, large. Stamens 5. Flower solitary.

Tribe II. Shrubs. Leaves opposite, simple: no stipules. Fruit capsular. — HYDRANGIEÆ.

* Stamens 20 or more: ovary inferior.

9. **Philadelphus.** Ovary 4 to 5-celled. Petals convolute in the bud.

* * Stamens 8 or 10: ovary superior or nearly so.

10. **Jamesia.** Calyx-tube adnate to the base of the 1-celled ovary and incompletely 3 to 5-celled capsule. Petals 5. Styles 3 to 5.
11. **Fendlera.** Calyx-tube half adherent to the 4-celled ovary and capsule. Petals 4. Filaments 2-lobed. Styles 4.

Tribe III. Shrubs. Leaves alternate, simple: stipules adnate to the petiole or wanting. Fruit a berry.

12. **Ribes.** Calyx-tube adnate to the 1-celled ovary: placentæ 2, parietal.

1. SAXIFRAGA, L. SAXIFRAGE.

Calyx 5-lobed or parted, free, or its tube more or less coherent with the lower part of the ovary. Petals entire. Stigmas mostly depressed-capitate or reniform. — Either stemless or short-stemmed: petioles commonly sheathing at base: the small flowers in cymes, cymose panicles, or clusters, sometimes solitary.

* *Stem more or less leafy.*

+ *Calyx free from the ovary: leaves opposite.*

1. **S. oppositifolia,** L. Leaves fleshy, ovate, keeled, ciliate, imbricated on the sterile branches: flowers solitary, large: petals purple, obovate, much longer than the 5-cleft calyx. — From the Teton Mountains northward and throughout Arctic America; also found in Vermont.

+ + *Calyx adherent to the ovary below: stem leaves alternate.*

+ + *Sepals distinct or coherent at base.*

= *Petals yellow.*

2. **S. Hirculus,** L. *Leaves lanceolate,* nerved, *not ciliate:* pedicels and upper part of the 1 to 6-flowered stem more or less hairy, *not glandular: sepals usually ciliate,* much shorter than the very large petals. — From Colorado to the Arctic Sea.

3. **S. flagellaris,** Willd. *Glandular-pubescent,* 1 to 5-flowered: *stolons from the axils of the radical leaves long and filiform,* naked and rooting at the ends: *leaves obovate-spatulate, ciliate;* the lower much crowded; the upper oblong or linear: flowers large: *sepals very glandular.* — From the high mountains of Colorado to the Arctic regions.

4. **S. aizoides,** L. Low, 3 to 5 inches high, in tufts, with few or several corymbose flowers: *leaves linear-lanceolate,* entire, *fleshy, distantly spinulose-ciliate: petals spotted with orange.* — "Alpine rivulets on the Rocky Mountains" (*Drummond*), throughout Arctic America, and found in some of the Atlantic States.

5. **S. chrysantha,** Gray. Dwarf, cespitose, *shoots creeping:* leaves rosulate, imbricated, *oblong-ovate, thick, very smooth:* stem filiform, few-leaved, *slightly glandular-pubescent,* 1 to 2 inches high, 1 to 3-flowered: *calyx segments reflexed.* — Proc. Am. Acad. xi. 83. The *S. serpyllifolia* of Fl. Colorado and Hayd. Rep. 1871. High alpine regions of the Colorado Rocky Mountains.

= = *Petals white or cream-color.*

6. **S. cæspitosa,** L. *Dwarf* (1 to 2 inches high), *cespitose: leaves glandular-pubescent,* 3 *to* 5-*cleft, segments broadly linear and obtuse;* the upper leaves linear and entire: flowering stems with a few scattered leaves, glandular, 1 to 4-flowered. — Mountains of Colorado and extending northward to lat. 56°.

7. **S. cernua,** L. Glabrate or glandular-pubescent: *stems granulate at base,* weak, 2 to 5 inches high: *lower leaves reniform, broadly toothed or lobed; the upper ones bearing little bulbs in their axils:* flowers often solitary, terminal, pendulous: petals retuse. — Mountains of Colorado and northward throughout the Arctic regions.

8. **S. bronchialis,** L. Stems slender, producing short branchlets: *leaves linear, rather coriaceous, finely ciliate, mucronate-pointed, crowded below:* flowers corymbose on a long, slender, bracted peduncle: *petals marked with numerous purplish spots.* — From Colorado northward to the N. W. Coast.

+ + + + *Sepals coherent at least to the middle: petals not yellow.*

9. **S. rivularis,** L. Small: stems weak, 3 *to* 5-*flowered: lower leaves rounded,* 3 *to* 5-*lobed,* on slender petioles, the upper lanceolate: *petals white, ovate.* — Mountains of Colorado and northward; also in the White Mountains.

10. **S. adscendens,** L. Glandular-pubescent: stems 1 to 3 inches high, erect: *leaves cuneate-ovate,* 3 *to* 5-*toothed at the apex,* the earlier spatulate and entire, radical ones crowded: *branchlets* 3-*flowered: petals pinkish or yellowish white.* — Mountains of Colorado.

11. **S. Jamesii,** Torr. Glandular-puberulent: stems 2 to 6 inches high from a thick caudex, 5 *to* 10-*flowered: radical leaves reniform-cordate, smoothish, crenately-toothed or -lobed;* cauline few, *the uppermost bract-like, cuneiform:*

raceme compound: *petals purple, orbicular.* — Mountains of Colorado and northward in the Teton Range and the National Park.

+– +– +– *Calyx wholly adherent.*

12. **S. debilis,** Engelm. Glabrous or very sparingly glandular-pubescent: stems weak, ascending, 2 to 4-flowered, 2 to 4 inches high: radical leaves small, crenately lobed; cauline 3-lobed or entire: petals white or pinkish, ovate, obtuse. — Mountains of Colorado and northward into Wyoming.

* * *Stemless: petals white.*

+– *Calyx free from the ovary, or nearly so: sepals almost distinct, reflexed.*

13. **S. punctata,** L. Villous-pubescent or nearly glabrous: leaves long-petioled, *reniform or orbicular, equally and deeply dentate:* scape slender, naked, 1 *to* 1½ *feet high,* the peduncles and pedicels of the usually *open panicle* glandular: *petals oval or orbicular.* — Colorado, Utah, and northward into British America.

14. **S. stellaris,** L., var. **comosa,** Poir. *Leaves wedge-shaped, more or less toothed: scape* 4 *to* 5 *inches high,* bearing a *small contracted panicle:* many or most of the flowers changed into little tufts of green leaves: *petals* unequal, *lanceolate and tapering into the claw.* — Mt. Evans, Colorado (*Greene*); also in Maine and far northward.

+– +– *Calyx adherent to the ovary at base.*

++ *Sepals erect.*

15. **S. nivalis,** L. Leaves ovate or obovate, attenuate into a broad petiole, unequally crenate-dentate: *scape* 2 *to* 5 *inches high, capitately or subcorymbosely several to many-flowered: petals oblong:* capsules purple. — Colorado and northward to Arctic America.

16. **S. Virginiensis,** Michx. Like the preceding, but larger and more open: *scape a span to a foot high, at length loosely many-flowered in a paniculate cyme: petals obovate.* — In the Rocky Mountains and Coast Ranges; also common in the Atlantic States.

++ ++ *Sepals spreading, or at length reflexed.*

17. **S. integrifolia,** Hook. Leaves from ovate or obovate to lanceolate-spatulate, 1 to 5 inches long, denticulate or entire, narrowed at base into a very short and margined petiole: scape 1 to 3 feet high, viscid: flowers in small clusters usually in a narrow thyrsiform panicle: petals obovate or broadly spatulate. — *S. hieracifolia* of Hayd. Rep. for 1871 and 1872. From Colorado northward to the Yellowstone and westward to the Sierras.

2. BOYKINIA, Nutt.

Calyx 5-lobed. Petals entire, the base contracted into a short claw. — Perennial, with creeping rootstocks, leafy simple stems, and paniculate or corymbose cymes of white flowers: the leaves all alternate, round-reniform, palmately lobed and incised or toothed, the teeth with callous-glandular tips, and the petiole mostly with stipule-like dilatations or appendages at base.

1. **B. major,** Gray. Stem 2 or 3 feet high: leaves 4 to 8 inches in diameter, 5 to 9-cleft: petioles abruptly appendaged at base, the lower with scari-

ous, the upper with foliaceous and rounded stipules. — In the Sierras from California to Oregon and extending into the Bitter-Root Mountains.

3. TELLIMA, R. Br.

Calyx campanulate or turbinate, 5-lobed; the base of the tube coherent with the base or lower half of the ovary. — Perennials: with palmately-divided leaves, few on the simple stems; their petioles with stipule-like dilatations at base: flowers in a simple terminal raceme; petals white or pink. In ours the slender or filiform rootstock and sometimes even the few-flowered raceme bear clusters of small grain-like bulblets.

1. **T. parviflora,** Hook. *Roughish-hirsute or scabrous-pubescent, a span to a foot high:* divisions of the leaves narrowly cuneate and once or twice 3-cleft: *calyx obconical or at length almost clavate: petals deeply 3-cleft* into linear or oblong divisions: *ovary and capsule fully half-inferior.* — Colorado, Utah, and northward through the Yellowstone region to British America.

2. **T. tenella,** Watson. Small and slender, 2 *to* 9 *inches high, roughish with a minute glandular pubescence:* leaves smaller than the preceding ($\frac{1}{2}$ inch in diameter): *calyx campanulate: petals* 3 *to* 5*-parted or even irregularly* 7*-parted* into mostly linear divisions: *ovary and capsule free except the base.* — Bot. King's Exp. 95. Colorado and the Teton Mountains, thence west to the Sierras.

4. TIARELLA, L.

Calyx 5-parted; the base almost free from the ovary, the lobes more or less colored. — Perennial, low or slender: with palmately lobed or divided alternate leaves, and a terminal raceme or panicle of small white flowers.

1. **T. unifoliata,** Hook. Somewhat pubescent or hairy: flowering stems a span to a foot or more long: leaves thin, cordate, either rounded or somewhat triangular, 3 to 5-lobed and the lobes crenate-toothed; the radical ones slender-petioled; the cauline mostly one, smaller, and short-petioled, or sometimes 2 or 3 similar to the radical. — From California to British Columbia and extending into N. W. Montana.

5. MITELLA, Tourn. Mitre-wort.

Calyx 5-cleft, short, coherent with the base of the ovary. — Low and slender perennials: with round heart-shaped alternate leaves on the rootstock or runners; those on the scape opposite, if any: flowers small, in a simple slender raceme or spike.

1. **M. pentandra,** Hook. *Leaves* all radical, cordate, slightly lobed, *crenately serrate: calyx adherent nearly to the summit of the ovary: petals pectinate-pinnatifid: stamens opposite the petals:* stigmas 2-lobed. — From Colorado to the Yellowstone and the Bitter-Root Mountains.

2. **M. trifida,** Graham. *Leaves* as in the last, but *dentate: calyx adherent to the middle of the ovary: petals* 3 *to* 5*-parted: stamens opposite the calyx-lobes:* stigmas entire. — By mistake in Fl. Colorado this species was described under the name *M. pentandra.* From Colorado to British America, and also in California.

6. CHRYSOSPLENIUM, Tourn. Golden Saxifrage.

Calyx-tube coherent with the ovary; the blunt lobes 4 or 5, yellow within. Stamens inserted on a conspicuous disk. — Low and small smooth herbs, with tender succulent leaves, and small corymbose flowers.

1. **C. alternifolium,** L. Flowering stems erect: leaves alternate, reniform-cordate, doubly crenate or somewhat lobed. — Colorado and northward.

7. HEUCHERA, L. Alum-root.

Calyx 5-cleft, bell-shaped. — Perennials: with the round heart-shaped leaves principally from the rootstock; those on the scapes, if any, alternate: petioles with dilated margins or adherent stipules at their base: flowers in small clusters disposed in a prolonged and narrow panicle, greenish or purplish.

* *Stamens and styles exserted.*

1. **H. rubescens,** Torr. Scape usually naked, glabrous or somewhat scabrous, 8 to 15 inches high: leaves nearly glabrous, suborbicular, cordate at base, slightly lobed, crenate-dentate, the teeth ciliate: panicle loosely many-flowered, often somewhat reddish: petals linear, more or less rose-colored or white. — From New Mexico and S. W. Colorado to the mountains of Nevada and the Wahsatch.

* * *Stamens and styles included (at least at first).*

+ *Generally hirsute: flowers rather large.*

2. **H. hispida,** Pursh. *Scapes 2 to 4 feet high,* hispid or hirsute with long spreading hairs, *scarcely glandular:* leaves rounded, slightly 5 to 9-lobed: *panicle very narrow: stamens at first included, but soon exserted, longer than the spatulate petals.* — Along the Missouri to the mountains, and northward and eastward.

3. **H. cylindrica,** Dougl. Commonly hirsute and *above glandular-pubescent: leaves round-reniform* or cordate-ovate, *crenately doubly toothed* and commonly lobed: *scape 10 to 24 inches high: the greenish flowers in a cylindrical spike or thyrsus: petals inconspicuous or none.* — National Park, Montana, and westward into Nevada, Oregon, etc.

+ + *Puberulent or glabrous: flowers small.*

++ *Panicle glomerate, spicate.*

4. **H. bracteata,** Seringe. Small, 3 to 6 inches high: scapes numerous from a thick woody caudex: radical leaves roundish-subcordate, incisely lobed, lobes crenately toothed: petals attenuate, scarcely broader than the filaments: styles and stamens at length exserted. — Mountains of Colorado.

++ ++ *Panicle loose, racemose.*

5. **H. Hallii,** Gray. *Minutely glandular-puberulent: scapes 4 to 8 inches high,* naked or with 1 to 3 minute subulate bracts: *petals narrowly spatulate, obtuse, exsert.* — Colorado.

6. **H. parvifolia,** Nutt. *Scabrous-puberulent: scape* naked, 6 *inches to 2 feet high:* leaves roundish-cordate, crenately 5 to 7-lobed: *petals minute, caducous:* seeds muricate or hispid under a lens. — Torr. & Gray, Fl. i. 581. From New Mexico northward through Montana.

8. PARNASSIA, Tourn. Grass of Parnassus.

Perennial smooth herbs, with the leaves entire and chiefly radical, and the large solitary flowers terminating the long naked stems. Petals white, with greenish or yellowish veins.

* *Petals sessile, entire.*

1. **P. parviflora,** DC. *Leaves ovate or oblong, tapering at the base:* petals little longer than the calyx: *sterile filaments about* 5 *in each set.* — Along streams in the mountains and eastward to Lake Michigan.

2. **P. palustris,** L. *Leaves heart-shaped:* flower nearly an inch broad: petals rather longer than the calyx, few-veined: *sterile filaments* 9 *to* 15 *in each set.* — Montana and Wyoming, eastward to Lake Superior, and throughout British America.

* * *Petals contracted into a short claw, fringed.*

3. **P. fimbriata,** Banks. Leaves from reniform to cordate-ovate: the margin of the petals fringed below the middle or towards the base: sterile filaments 5 to 9 in each set and united below into a fleshy carinate scale, or sometimes a dilated scale destitute of bristle-like filaments. — From Colorado to California and northward to British America.

9. PHILADELPHUS, L. Syringa. Mock Orange.

Calyx-limb 4 to 5-parted. Petals rounded or obovate, large. Styles 3 to 5, united below or nearly to the top. Seeds with a loose membranaceous coat prolonged at both ends. — In ours the leaves are entire, and the showy white flowers 1 to 3, terminal.

1. **P. microphyllus,** Gray. Branches slender, erect: leaves small, 6 to 9 lines long, ovate-lanceolate or oblong, shining above, pale and minutely pilose beneath, narrowed at base into a very short petiole: calyx 4-cleft, glabrous without, tomentulose within: styles united to the apex. — Pl. Fendl. 54. S. Colorado and southward.

10. JAMESIA, Torr. & Gray.

Calyx-lobes sometimes bifid. Petals 5, obovate. Alternate stamens shorter; filaments linear, flattened acuminate. Capsule included. Seeds striate-reticulate. — Low, diffusely branching, 2 to 3 feet high: leaves ovate, mucronately serrate, canescent beneath, as well as the petioles, calyx, and branchlets, with a soft hairy pubescence: flowers cymose, in terminal panicles.

1. **J. Americana,** Torr. & Gray. Cymes often longer than the leaves, 5 to 10-flowered: petals white, glabrous or softly hairy within: calyx-lobes shorter than the petals, enlarged and foliaceous in fruit. — Fl. i. 593. Utah, Colorado, and New Mexico.

11. FENDLERA, Eng. & Gray.

Calyx-tube 8-ribbed. Petals ovate-deltoid, unguiculate, emarginate. Stamens 8: filaments 2-forked at the apex, the lobes divaricate and extended beyond the cuspidate anther. Capsule crustaceous. Seeds reticulate, winged below. — Erect shrub.

1. **F. rupicola,** Eng. & Gray. Pubescent or glabrate, branches terete, striate: leaves deciduous, subsessile, oblong, very entire, 3-nerved at base: flowers 1 to 3, terminal on the short branchlets, peduncled, white. — Pl. Wright. i. 77. S. W. Colorado and southward.

— 12. RIBES, L. Currant. Gooseberry.

Calyx 5-lobed, often colored. Petals 5, small. Styles 2, distinct or united. Berry crowned with the shrivelled remains of the calyx. — Low, sometimes prickly, with palmately-lobed leaves, often clustered in the axils; the small flowers from the same clusters, or from separate lateral buds.

§ 1. *Mostly thorny under the fascicles, and sometimes scattered-prickly or bristly along the branches: leaves plaited in the bud: calyx mostly recurved or reflexed at flowering-time.* — Gooseberry.

* *Calyx-tube campanulate to cylindraceous: peduncle* 1 *to* 4*-flowered.*

+ *Flowers yellow or yellowish: leaves seldom* ½ *inch in diameter: anthers oval-oblong.*

1. **R. leptanthum,** Gray. Much branched and rigid, 1 to 4 feet high, with comparatively large single or triple thorns: leaves roundish, 3 to 5-cleft, and the lobes crenately-incised or toothed: peduncles very short, 1 to 2-flowered: berry glabrous. — Pl. Fendl. 53. New Mexico, Colorado, and in the Sierras.

+ + *Flowers greenish, white, or dull purplish: leaves mostly an inch or two in diameter: anthers shorter, mostly didymous.*

++ *Ovary and berry unarmed and glabrous: berry pleasant.*

2. **R. divaricatum,** Dougl., var. **irriguum,** Gray. Nearly glabrous or soft-pubescent: *stems* 5 *to* 12 *feet high,* with widely spreading branches; the thorns single or triple: *leaves nervose-veiny at base,* 3 *to* 5*-lobed,* the lobes incisely toothed: *the* 2 *to* 4*-flowered peduncle and pedicels slender, drooping: calyx livid purplish or greenish white: petals fan-shaped, white:* berry dark purple. — *R. irriguum,* Dougl. From Colorado and Idaho to Nevada and Oregon.

3. **R. oxyacanthoides,** L. Mostly glabrous, 2 *to* 4 *feet high;* thorns single or triple, small: *leaves usually deeply* 5*-lobed,* the lobes incised and coarsely toothed: *the* 2 *to* 3*-flowered peduncles very short:* calyx greenish-white or flesh-colored: *stamens and* 2*-cleft style scarcely longer than the bell-shaped calyx:* berry small, purple. — *R. hirtellum,* Michx. From Colorado northward throughout British America; also in California and the N. Atlantic States.

4. **R. rotundifolium,** Michx. Leaves smooth or downy: *peduncles slender,* 1 *to* 3*-flowered: stamens and* 2*-parted style slender, longer than the narrow cylindrical calyx:* fruit smooth. — The Upper Missouri, and extending eastward to the Atlantic States.

++ ++ *Berry armed with long prickles like a burr, or rarely smooth.*

5. **R. Cynosbati,** L. Spines small or obsolete: leaves pubescent: stamens and undivided style not longer than the broad calyx: berry large. — Near the sources of the Platte, and thence through the N. Atlantic States to Canada.

* * *Calyx-tube saucer-shaped, expanding immediately above the ovary: peduncles racemosely 5 to 15-flowered: anthers very short, pointless: berry small and currant-like, beset with some scattered gland-tipped bristles.*

6. **R. lacustre,** Poir. Young stems clothed with bristly prickles, and with weak thorns: leaves heart-shaped, 3 to 5-parted, with the lobes deeply cut. — From California and the Rocky Mountains to the N. Atlantic States and Labrador.

Var. **parvulum,** Gray. Smaller and nearly glabrous. — The commoner western form.

§ 2. *Thornless and prickless: leaves plaited in the bud: berry unarmed (except in No. 7).* — CURRANT.

+* *Calyx dilated immediately above the ovary, rotate or saucer-shaped, 5-parted.*

7. **R. prostratum,** L'Her. Stems reclined: leaves deeply heart-shaped, 5 to 7-lobed, smooth; the lobes ovate, acute, doubly serrate: *racemes erect, slender, flowers greenish: pedicels and the pale red fruit glandular bristly.* — From Colorado northward throughout British America, and in the Atlantic States.

8. **R. Hudsonianum,** Richards. Resembles the last, but the *flowers are white and crowded in the erect raceme,* and the *berry is darker and smooth.* — The *R. bracteosum* of King's and Hayden's Reports, not of Douglas. Montana, Wyoming, and thence through British America to Hudson's Bay.

+ 9. **R. cereum,** Dougl. Minutely pubescent, *usually resinous dotted and more or less glutinous,* sometimes glabrous: leaves rounded or reniform, obscurely or more decidedly 3-lobed, crenately toothed or incised: *racemes drooping:* pedicels hardly any or shorter than the bract: *calyx waxy-white,* sometimes greenish or pinkish: berry reddish, sweetish. — From New Mexico to Washington Territory and Dakota.

Var. **pedicellare,** Gray. Pedicels slender and longer than the bract. — Montana.

* * *Calyx prolonged above the ovary into a campanulate or cylindrical tube: fruit and foliage more or less glandular: bracts conspicuous.*

+ *Flowers dull white or greenish, or sometimes purplish-tinged: racemes somewhat corymb-like and few-flowered: berry black, smooth.*

10. **R. viscosissimum,** Pursh. Pubescent and *viscid-glandular:* leaves cordate-rounded: *racemes ascending; bracts rather shorter than the pedicels.* — Idaho and Montana; also in California.

11. **R. floridum,** L. *Leaves sprinkled with resinous dots,* slightly heart-shaped, sharply 3 to 5-lobed: *racemes drooping,* downy: *bracts longer than the pedicels.* — On the Platte in Colorado, and common in the Atlantic States.

+ + *Flowers rose-red, or varying to white: racemes drooping, many-flowered: berry blackish, somewhat hispid-glandular, tough and not juicy.*

12. **R. sanguineum,** Pursh. Two to twelve feet high, varying from nearly glabrous to tomentose-canescent, either almost glandless or glandular: leaves rounded-cordate.

Var. **variegatum,** Watson. Low, nearly glabrous: raceme short and dense, ascending, barely glandular: calyx rose-color: petals white. — *R. Wolfi,* Rothrock. Mountains of Colorado; also in California.

§ 3. *Thornless and prickless: leaves convolute in the bud: calyx-tube elongated: berry naked and glabrous.*

13. **R. aureum,** Pursh. Five to twelve feet high, glabrous or almost so, glandless: leaves 3 to 5-lobed: racemes short, 5 to 10-flowered, with mostly foliaceous bracts: flowers golden-yellow, spicy-fragrant: tube of the salver-form calyx 3 or 4 times longer than the lobes: berry yellowish turning blackish. — Colorado and northward, westward to the Pacific coast; also common in cultivation throughout the Atlantic States. Known as the Buffalo or Missouri Currant.

ORDER 28. CRASSULACEÆ. (ORPINE FAMILY.)

Succulent or fleshy plants, mostly herbaceous, and not stipulate, with completely symmetrical as well as regular flowers, with all the parts distinct, the carpels becoming follicles in fruit.

1. **Tillæa.** Parts of the flower each 3 to 5: the stamens only as many. Small annuals, with opposite leaves and minute axillary flowers.
2. **Sedum.** Parts of the flower each 4 to 7: stamens twice as many. Low annual or perennial herbs, with cymose conspicuous flowers.

1. TILLÆA, L.

Seeds longitudinally striate. — Glabrous: leaves entire: flowers white or reddish.

1. **T. Drummondii,** Torr. & Gray. Stems diffuse, *dichotomous*, about an inch high: *leaves oblong-linear*, somewhat connate: *flowers on pedicels at length as long as the leaves: carpels* 12 *to* 20-*seeded.* — Fl. i. 558. S. W. Colorado to Texas and Louisiana.

2. **T. angustifolia,** Nutt. Stems decumbent, rooting at base, diffusely branched, an inch long: *leaves linear*, connate, a line or two long: *flowers sessile or on very short pedicels: carpels* 8 *to* 12-*seeded.* — Torr. & Gray, Fl. i. 558. From Colorado to Oregon.

2. SEDUM, L. STONE-CROP.

Sepals united at base. — Flowers rarely dicœcious, in cymes, often secund.

* *Flowers mostly dicœcious, in a regular compact compound cyme, deep purple or becoming so: leaves serrate, flat.*

1. **S. Rhodiola,** DC. Stems 1 to 10 inches high, from a thick fragrant root, leafy: leaves alternate, oblong-oblanceolate: cyme sessile: flowers on short naked pedicels, usually 4-merous. — From Colorado northward to the Arctic coast, and eastward across the continent.

* * *Flowers perfect, in a simple terminal cyme, rose-color or nearly white: leaves entire, flat.*

2. **S. rhodanthum,** Gray. Stems a half to a foot high, from a thick root: leaves scattered, oblong or oblanceolate: flowers large, mostly 4-merous. — Mountains of Colorado, Utah, and Montana.

* * * *Flowers perfect, secund upon the branches of a forked cyme, mostly yellow or yellowish: leaves very fleshy, entire.*

+ *Leaves narrowed toward the base, obtuse.*

3. **S. debile,** Watson. Stems weak, 2 to 4 inches high, from very slender running rootstocks: leaves rounded or obovate: flowers on rather long pedicels, in small cymes. — Bot. King's Exp. 102. In the Wahsatch and Uintas; also mountains of Nevada and N. California.

+ + *Leaves broadest at base, acute.*

4. **S. stenopetalum,** Pursh. Stems 3 to 6 inches high, simple or sometimes branched: leaves narrowly lanceolate: *flowers bright yellow, nearly sessile.* — Torr. & Gray, Fl. i. 560. Very common on both sides of the mountains from Colorado to Montana and into Oregon.

5. **S. Douglasii,** Hook. Stems 3 to 4 inches high, branching at base, from a stout proliferous rootstock: leaves lanceolate or the lowermost linear-subulate, membranaceous when dry: flowers sometimes polygamous, *sessile: follicles at length divaricately spreading from their united bases.* — National Park, W. Montana, Oregon, and California.

Order 29. **HALORAGEÆ.** (Water-Milfoil Family.)

Aquatic herbs, with inconspicuous and often apetalous flowers sessile in the axil of leaves or bracts, calyx adnate to the ovary in fertile ones, the fruit indehiscent and nut-like.

1. **Hippuris.** Leaves linear, in whorls of 8 or 12. Flowers perfect. Calyx entire. Petals none. Stamen and cell of the ovary one.
2. **Myriophyllum.** Immersed leaves pinnately dissected. Flowers monœcious or polygamous. Parts of the flower in fours.

1. HIPPURIS, L. Mare's Tail.

Calyx-tube globular. — Smooth: with erect simple leafy stems: leaves entire: flowers solitary.

1. **H. vulgaris,** L. Stems a foot or two high: leaves usually a half to an inch long, but often much longer, especially the submerged ones: calyx hardly a half-line long. — In shallow ponds throughout the northern part of the continent, and southward in the Rocky Mountains to New Mexico.

2. MYRIOPHYLLUM, L. Water-Milfoil.

Limb of the calyx 4-lobed in the sterile flowers, wanting or minutely toothed in the others. Petals 2 to 4, minute or wanting in the pistillate flowers. Stamens 8 (in ours). Ovary 4-celled: stigmas recurved and plumose. — Smooth leafy herbs: leaves whorled in threes or fours: upper flowers usually staminate, the lower pistillate, and the intermediate ones perfect.

1. **M. spicatum,** L. Leaves all pinnately parted and capillary, *except the floral ones or bracts; these ovate, entire or toothed, and chiefly shorter than the flowers,* which thus form an interrupted spike. — In the Atlantic States and across the continent.

2. **M. verticillatum,** L. Like the last, but *floral leaves much longer than the flowers and pectinate pinnatifid.* — Snake River (*Coulter*); in the Atlantic States and northward.

Order 30. LYTHRACEÆ. (Loosestrife Family.)

Herbs with simple and entire leaves, calyx tubular or campanulate and free from the ovary and capsule, but enclosing it, the petals and definite stamens borne in its throat, a single style, and numerous small seeds on a central placenta. Distinguished from *Haloragaceæ* and *Onagraceæ* by the free ovary, and from the former also by the numerous seeds.

1. **Ammannia.** Calyx barely 4-angled, short. Petals 4 or none. Stamens 4 or 8. Capsule globular, bursting irregularly. Leaves opposite.
2. **Lythrum.** Calyx striate, cylindrical. Petals commonly 6 (4 to 7). Stamens as many or twice as many. Capsule oblong or cylindraceous.

1. AMMANNIA, Houston.

Calyx 4-toothed, with as many intermediate small tooth-like processes. Petals as many, small and fugacious, or none. — Low and smooth annuals, with 4-angled stems, sessile leaves, and small axillary flowers.

1. **A. latifolia,** L. Stems erect: leaves linear-lanceolate, with a broad auricled base: flowers 1 to 5 in each axil, mostly closely sessile. — Milk River, N. Montana; also in Nevada, California, and the S. Atlantic States.

2. LYTHRUM, L. Loosestrife.

Calyx 4 to 7-toothed, with intermediate tooth-like processes. Petals oblong-obovate, often conspicuous. — Erect slender herbs, with angled stems, and axillary mostly solitary flowers.

1. **L. alatum,** Pursh. Tall and wand-like perennial, smooth: branches with margined angles: leaves from oblong-ovate to lanceolate, the upper scattered, not longer than the flowers, which are small and nearly sessile in the axils: proper calyx-teeth often shorter than the intermediate processes: petals purple. — From Colorado to the N. Atlantic States, and southward.

Order 31. ONAGRACEÆ. (Evening-Primrose Family.)

Herbs, with perfect symmetrical flowers, the parts being most commonly in fours, the calyx-tube adnate to the ovary and its lobes often colored, the petals borne on its throat or at the sinuses, the cells of the ovary usually of the same number, the stamens as many or twice as many, and styles always single. Leaves simple, but sometimes lobed or divided, either alternate or opposite: no stipules. Flowers often showy. In ours the limb of the calyx is deciduous.

* Capsule loculicidal, many-seeded (the cells rarely only several-seeded). Parts of the flower in fours.

+ Seeds comose at the apex: lower leaves often opposite: stamens 8.

1. **Zauschneria.** Calyx-tube continued much beyond the ovary, funnel-form.
2. **Epilobium.** Calyx 4-parted nearly down to the ovary, or with a short and campanulate tube beyond it.

+ + Seeds not comose: leaves all alternate.

++ Anthers attached near the middle and versatile: petals generally yellow or white or sometimes changing to rose-color.

3. **Gayophytum.** Calyx-tube not produced beyond the ovary; this and the membranous capsule only 2-celled. The stamens opposite the petals usually sterile.
4. **Œnothera.** Calyx-tube produced beyond the ovary into a linear or obconical tube. Anthers all uniform. Petals without claws.

++ ++ Anthers attached at or near the base, remaining erect; those opposite the petals much shorter, or sterile, or rarely wanting: petals never yellow.

5. **Clarkia.** Calyx-tube above the ovary obconical; its lobes reflexed. Petals with claws, either lobed or entire. Capsule coriaceous.

* * Fruit dry and indehiscent, 1 to 4-seeded. Parts of the flower in fours, or rarely threes. In ours the stamens are 8, and the anthers are attached by the middle.

6. **Stenosiphon.** Alternate stamens a little shorter. Ovary 1-celled. Leaves scattered.
7. **Gaura.** Stamens nearly equal: filaments with a scale-like appendage on the inside next the base. Ovary 4-celled. Leaves alternate.

* * * Fruit indehiscent, bur-like, 1 to 2-seeded. Parts of the flower in twos throughout.

8. **Circæa.** Leaves opposite.

1. ZAUSCHNERIA, Presl.

Calyx-tube deeply colored above the ovary, with a small globose base and 4-lobed limb, appendaged with 8 small scales, 4 erect and 4 deflexed. Petals obcordate or 2-cleft, scarlet. Stamens exserted. Style long and exserted. Capsule linear, obtusely 4-angled. — Low decumbent perennial, sómewhat woody at base: leaves sessile: the large scarlet Fuchsia-like flowers in a loose spike.

1. **Z. Californica,** Presl. More or less villous and often tomentose: leaves narrowly lanceolate to ovate, entire or denticulate: capsule attenuate to the slender base, sometimes shortly pedicellate. — From New Mexico to the Wahsatch and N. W. Wyoming, and thence to California.

2. EPILOBIUM, L. Willow-Herb.

The alternate stamens shorter: anthers fixed near the middle. Capsule linear, 4-sided. — Perennial or annual: leaves alternate or opposite, nearly sessile, denticulate or entire, often fascicled: flowers rose-color, purple, or white, very rarely yellow.

* *Flowers large: stamens and style declined: stigma-lobes spreading: leaves scattered.*

1. **E. spicatum,** Lam. *Stem erect, simple, often 4 to 7 feet high: leaves lanceolate,* sessile, nearly entire, *the veins anastomosed near the edge: flowers in a long spicate raceme,* bracteate, purplish-lilac: *style hairy at the base,* at first deflexed. — *E. angustifolium,* L. Common across the continent.

2. **E. latifolium,** L. Differing from the last in its *short ascending occasionally branched stem: ovate-lanceolate,* somewhat pubescent, *rather thick and rigid leaves, veins not apparent: very large axillary and terminal flowers* on short pedicels: somewhat erect *glabrous style.* — Mountains of Colorado to Arctic America.

* * *Flowers small, white: stamens and style erect, the latter much exserted: stigma thick, with 4 spreading lobes: leaves opposite.*

3. **E. suffruticosum,** Nutt. Stems decumbent, much branched: leaves linear-lanceolate, entire, somewhat canescent: flowers axillary near the ends of the branches: capsule clavate, narrowed at each end, on a very short pedicel. — Torr. & Gray, Fl. i. 488. Wahsatch Mountains near Ogden, Utah, and northwestward to Oregon and Washington Territory.

* * * *Flowers small: stamens and style erect, the latter included: stigma clavate or cylindrical: lower leaves commonly opposite, the upper often alternate.*

+– *Herbaceous perennials.*

4. **E. alpinum,** L. *Low, 2 to 6 inches high, nearly glabrous: stems ascending* from a stoloniferous base, *simple: leaves elliptical or ovate-oblong, nearly entire, on short petioles:* flowers few or solitary, *drooping in the bud:* petals purple: *pods glabrous.* — Throughout the northern part of the continent; in the Rocky Mountains as far south as Colorado.

5. **E. affine,** Bong. *Stem erect,* 6 inches to a foot high, *simple, glabrous: leaves sessile,* partly clasping, *irregularly denticulate: flowers sessile:* petals 2-cleft. — Torr. & Gray, Fl. i. 489. W. Montana and northward.

6. **E. palustre,** L., var. **lineare,** Gray. *Erect, 1 to 2 feet high, branched above, minutely hoary pubescent: leaves narrowly lanceolate or linear, nearly entire: flower-buds somewhat nodding:* petals purplish or white: *pods hoary.* — *E. palustre,* var. *albiflorum,* Lehm. Colorado and northward, thence across the continent to New England.

7. **E. coloratum,** Muhl. *Stem erect, 1 to 3 feet high, glabrous or nearly so: leaves lanceolate to ovate-oblong, denticulate;* the middle ones sometimes decurrent; the lower slightly petioled: *flower-buds erect:* petals purplish, emarginate or 2-cleft: *pods minutely pubescent.* — Includes *E. tetragonum* of the Western reports. From Colorado northward, and eastward throughout the N. United States.

8. **E. origanifolium,** Lam. *Stem generally simple, terete,* 6 to 12 inches high, *with two pubescent lines: leaves more or less petioled; the lower rounded, the middle ones oval and equally pointed at each end, the upper acuminate:* flowers large, varying from dark purple to pure white: capsules sometimes nodding. — In the Sierras from California northward, and extending into the Bitter-Root Mountains.

+– +– *Annuals.*

9. **E. paniculatum,** Nutt. Glabrous or pubescent above: stem erect, 10 inches to 10 feet high, dichotomous above: leaves narrowly linear, obscurely serrulate, mostly alternate and fascicled; the uppermost subulate: flowers few, terminating the spreading filiform and almost leafless branches: petals obcordate. — Torr. & Gray, Fl. i. 490. From Colorado through Montana and Washington Territory.

3. GAYOPHYTUM, A. Juss.

Calyx-lobes reflexed. Petals white or rose-colored. — Very slender branching annuals, with linear entire leaves, and very small axillary flowers.

1. **G. ramosissimum,** Torr. & Gray. Glabrous, or the inflorescence puberulent, *diffusely much branched:* flowers ½ line long, *mostly near the ends of the branches: capsule oblong,* 2 *or* 3 *lines long, on pedicels of about the same length or shorter,* often deflexed, 3 *to* 5*-seeded.* — Fl. i. 513. Colorado and northward, and westward to Oregon and California.

2. **G. racemosum,** Torr. & Gray. Glabrous, or more or less canescent with short appressed pubescence, *the elongated branches mostly simple:* flowers ½ line long, *axillary the whole length of the branches: capsules linear, sessile or very shortly pedicelled,* 8 *to* 10 *lines long, usually many-seeded.* — Fl. i. 514. Colorado and northward, thence westward to Washington Territory and California.

4. ŒNOTHERA, L. Evening Primrose.

Calyx-lobes reflexed. Petals obcordate or obovate. Stamens 8. Capsule coriaceous or somewhat woody to membranaceous. — Herbs, or sometimes woody at base: flowers axillary, spicate, or racemose. — Watson, Proc. Am. Acad. viii. 573.

§ 1. *Stigma lobes linear, elongated: calyx-tube linear, slightly dilated at the throat: anthers linear.*

* *Caulescent: flowers in a leafy spike, erect in the bud, yellow: capsules sessile, coriaceous: seeds in two rows.*

+– *Capsules oblong, slightly attenuate above: seeds with more or less margined angles, nearly smooth.*

1. **Œ. biennis,** L. Erect, rather stout, 1 to 5 feet high, usually simple: calyx-tube 1 to 2½ inches long: capsule ¾ to 1 inch long. — Common everywhere and very variable.

Var. **grandiflora,** Lindl. Petals equalling the calyx-tube. — Same range, but less common eastward.

+– +– *Capsules linear: seeds not margined, minutely tuberculate.*

2. **Œ. rhombipetala,** Nutt. Spike elongated, dense: calyx silky-canescent: petals rhombic-ovate. — Torr. & Gray, Fl. i. 493. Probably within the eastern limits of our range, and thence to the Indian Territory and northward to Minnesota.

* * *Caulescent: flowers nodding in the bud, white turning to rose-color: capsules sessile, mostly linear: seeds in a single row.*

3. **Œ. pinnatifida,** Nutt. Annual or biennial: *calyx-tips not free,* throat naked: *seeds oval, not angled, finely pitted.* — Along the eastern slope of the Rocky Mountains from Dakota to the Indian Territory and New Mexico.

4. **Œ. trichocalyx,** Nutt. Annual: *calyx very villous; the tips not free,* throat naked: *seeds lance-linear, smooth.* — Torr. & Gray, Fl. i. 494. *Œ. deltoidea,* Torr. From W. Wyoming to California, and thence to Arizona and New Mexico.

5. **Œ. albicaulis,** Nutt. Perennial: *stems white and shreddy: calyx-tips free,* throat naked: *seeds smooth, lance-linear.* — A very variable species. From New Mexico and Colorado to Washington Territory and British America.

6. **Œ. coronopifolia,** Torr. & Gray. Perennial: *calyx-tips* short, *free, throat very villous: capsule oblong: seeds ovate, angled, tuberculate.* — Fl. i. 495. From Nebraska to the Uintas, and southward to New Mexico.

* * * *Acaulescent, or nearly so: flowers erect in the bud, white or rose-color: capsules mostly sessile, ovate or ovate-oblong, obtusely or sharply angled, large and rigid.*

7. **Œ. cæspitosa,** Nutt. *Capsule oblong, ribbed, often doubly crested on the angles:* calyx-tube 2 to 7 inches long: petals ⅝ to 1¾ inches long. — *Œ. marginata,* Nutt. From the Upper Missouri to Nebraska and southward to Nevada, New Mexico, etc.

8. **Œ. triloba,** Nutt. *Capsule ovate,* persistent, *strongly winged, net-veined:* calyx-tips free, the tube 2 to 4 inches long: *petals ½ to 1 inch long.* — From British Columbia to Mexico, and westward to California.

Var. (?) **parviflora,** Watson. Flowers very small, about an inch or two long, fertilized in the bud and rarely fully opening: fruit abundant, forming at length a densely crowded hemispherical or cylindrical mass, nearly 2 inches in diameter and often 2 or 3 inches high. — Proc. Am. Acad. xii. 251. Plains of Kansas and Nebraska.

9. **Œ. brachycarpa,** Gray. *Capsule ovate, winged, more or less corky, smooth:* calyx-tube 2 to 4 inches long: *petals 1½ inch long, purplish:* seed-testa thickened. — Pl. Wright. i. 70. *? Œ. marginata,* var. *purpurea,* of the various reports. From Montana to Nevada, New Mexico, and W. Texas.

* * * * *Caulescent: flowers axillary: capsule ovate to orbicular, strongly angled and broadly winged.*

10. **Œ. canescens,** Torr. Low: capsule ovate, 3 *to* 4 *lines long: petals white and rose-color,* 6 lines long: *calyx-tube* 6 *to* 8 *lines long.* — From the head-waters of the Platte to New Mexico.

11. **Œ. Missouriensis,** Sims. Capsule 1 *to* 3 *inches long, with wings nearly as broad: calyx-tube* 2 *to* 5 *inches long: petals* 1 to 2½ inches long, *yellow:* seeds strongly crested. — From Missouri to Colorado and Texas.

§ 2. *Stigma capitate: calyx-tube linear, persistent: flowers erect in the bud, yellow: anthers oblong: capsules sessile, linear to ovate: seeds in two rows: mostly acaulescent.*

12. **Œ. breviflora,** Torr. & Gray. Subpubescent: leaves deeply pinnatifid: calyx-tube 3 to 6 lines long: petals 3 lines long. — Wyoming, Colorado, Utah, and westward.

§ 3. *Stigma discoid: calyx-tube more broadly dilated above: flowers erect in the bud, yellow, axillary: anthers oblong-linear: capsule mostly sessile, linear-cylindric.*

13. **Œ. Hartwegi,** Benth. Low, 3 to 15 inches high: leaves numerous, linear to lanceolate, *mostly entire:* calyx-tube 1 to 2 inches long, *the tips free and linear:* petals 4 to 12 lines long: capsule 8 to 10 lines long.

Var. **lavandulæfolia,** Watson. Taller, pubescent throughout: leaves mostly linear and shorter: calyx-segments less attenuated above. — *Œ. lavandulæfolia,* Torr. & Gray. From Kansas and Colorado to Mexico.

14. **Œ. serrulata,** Nutt. *Leaves* linear to lanceolate, *denticulate: the free calyx-tips short:* capsules 9 to 15 lines long. — From New Mexico and Texas northward to British America.

§ 4. *Stigma capitate: calyx-tube obconic or short funnelform: flowers in crowded bracteate or leafy spikes: anthers oblong: capsule linear, sessile, attenuated above, curved and contorted.*

15. **Œ. strigulosa,** Torr. & Gray, var. **pubens,** Watson. *Pubescence hirsute and spreading,* sometimes nearly smooth: *petals 1 to 2 lines long,* yellow, usually turning red: *capsule very narrowly linear,* often short-pedicelled. — Includes *Œ. deutata,* Torr. & Gray. From the Wahsatch westward through the Pacific States.

16. **Œ. andina,** Nutt. Dwarf, 1 to 3 inches high, *canescently puberulent: flowers a line long,* yellow: *capsule fusiform,* 3 to 6 lines long. — From E. Oregon to Montana, Wyoming, Nevada, and Utah.

§ 5. *As in* § 4, *but capsules linear to clavate, pedicelled and obtuse: caulescent: flowers in loose, naked racemes: seeds oblong-lanceolate.*

17. **Œ. scapoidea,** Nutt. *Puberulent or nearly glabrous:* leaves low on the stem, usually lyrately-pinnatifid: *calyx-tips not free: capsule 4 to 12 lines long.* — From W. Wyoming and S. Idaho to S. Utah and Colorado.

18. **Œ. brevipes,** Gr. Like the last, but stouter: *villous,* not puberulent: *calyx-tips free, thick: capsule 1 to 3 inches long.*

Var. **parviflora,** Watson. *Of a much more branching habit:* the leaves more distinctly pinnate: inflorescence more slender: flowers pale yellow, the petals 2 to 3 lines long. — Am. Nat. ix. 271. S. W. Colorado and S. Utah.

5. CLARKIA, Pursh.

Petals purple or violet. Anthers oblong or linear. Stigma with 4 broad lobes. Capsule linear, attenuate above, somewhat 4-angled. Seeds angled or margined. — Annuals, with erect brittle stems: leaves on short slender petioles, the uppermost sessile: flowers showy, nodding in the bud, in terminal racemes.

1. **C. pulchella,** Pursh. *Leaves linear-lanceolate to linear: petals 3-lobed, attenuate to a long claw which has a spreading tooth on each side:* perfect stamens with a linear scale on each side at base; *alternate stamens rudimentary and filiform: capsule 8-angled.* — Bitter-Root Valley, W. Montana, to Idaho, Oregon, and Washington Terr.

2. **C. rhomboidea,** Dougl. *Leaves oblong-lanceolate to oblong-ovate: petals entire, rhomboidal, with a short broad claw* which is often broadly toothed: *anthers all perfect;* filaments with hairy scales at the base: *capsule 4-angled.* — From the Wahsatch to California and Washington Terr.

6. STENOSIPHON, Spach.

Tube of the calyx filiform or almost capillary, much prolonged beyond the ovary, recurved or declined after flowering. Petals unguiculate, unequal.

Fruit (very small) coriaceous, ovate, convex externally, flattish within, about 8-ribbed. — A tall perennial herb, with virgate branches: linear-lanceolate, sessile, entire leaves, gradually reduced to bracts: flowers white, sessile, crowded in long and strict virgate spikes.

1. **S. virgatus,** Spach. Spikes in fruit sometimes nearly one foot long: bracts subulate, longer than the ovary: calyx pubescent, 4 to 5 lines long: petals rather large in proportion: ovary tomentose-pubescent. — From Colorado to Arkansas and Texas.

7. GAURA, L.

Calyx-tube prolonged beyond the obconic or clavate ovary. Petals with claws. Style hairy below. Fruit obtusely 4-angled and ridged upon the sides. — Leaves sessile: flowers in spikes or racemes, white or rose-colored, turning to red.

1. **G. biennis,** L. *Soft-hairy or downy, 3 to 8 feet high: leaves oblong-lanceolate, denticulate: fruit oval or oblong,* ribbed, downy. — Idaho and eastward to the Atlantic.

2. **G. parviflora,** Dougl. Clothed, besides the long soft-villous hairs, with a *minute slightly glandular pubescence, 2 to 5 feet high: leaves ovate-lanceolate, repand-denticulate, clothed on both sides with a soft velvety pubescence:* spikes virgate, dense: fruit *oblong-clavate, 4-nerved,* obtusely angled above. — From Washington Terr. to Texas.

3. **G. coccinea,** Nutt. *Canescent, puberulent or glabrate, 6 to 12 inches high,* very leafy: *leaves lanceolate, linear-oblong or linear, repand-denticulate or entire:* flowers in simple spikes, rose-color turning to scarlet: *fruit elliptical, terete, 4-sided above.* — Colorado to Montana and eastward to Arkansas and the Saskatchewan.

8. CIRCÆA, L. Enchanter's Nightshade.

Calyx-tube slightly prolonged above the ovoid ovary, the base nearly filled by a cup-shaped disk. Petals obcordate. Fruit pear-shaped, covered with hooked bristles. — Low slender erect herbs: leaves thin, petiolate: flowers small, white, in terminal and lateral racemes: fruit on slender spreading or deflexed pedicels.

1. **C Pacifica,** Ascherson & Magnus. Mostly glabrous: leaves ovate, rounded or cordate at base, repandly denticulate: calyx white, with a very small tube: fruit a line long. — The *C. alpina* of Fl. Colorado. From Colorado to the Saskatchewan and westward to California and Washington Terr.

Order 32. LOASACEÆ.

Herbaceous plants with either stinging or jointed and rough-barbed hairs, no stipules, calyx-tube adnate to a one-celled ovary, parietal placentæ, and a single style. Stamens usually very numerous, some of the outer occasionally petaloid. Flowers perfect, often showy.

1. MENTZELIA, L.

Calyx-tube cylindrical or turbinate: the limb 5-lobed. Petals 5 or 10. Stamens inserted below the petals on the throat of the calyx. Ovary truncate at the summit: style 3-cleft, the lobes often twisted. Capsule opening usually irregularly at the apex. — Erect, the stems becoming white and shining: leaves alternate, mostly coarsely toothed or pinnatifid: flowers cymose or solitary, orange or golden yellow to white.

* *Seeds few, oblong, not winged: petals* 5, *not large: filaments all filiform: leaves petioled, cut-toothed or angled.*

1. **M. oligosperma,** Nutt. Rough and adhesive, 1 to 3 feet high, much branched, branches brittle: leaves ovate and oblong: petals yellow, wedge-oblong, pointed: capsule about 9-seeded. — From the mountains eastward across the plains to Illinois and Texas.

* * *Seeds few to many, irregularly angled or somewhat cubical, not winged: petals* 5, *not large: filaments all filiform: capsule linear: leaves sessile, sinuately toothed or pinnatifid.*

2. **M. albicaulis,** Dougl. Slender, 3 inches to a foot high or more: leaves linear-lanceolate, *pinnatifid with numerous narrow lobes,* upper leaves broader: flowers mostly approximate near the ends of the branches: petals spatulate or obovate: capsule linear-clavate: seeds numerous, *rather strongly tuberculate, irregularly angled* with obtuse margins. — Torr. & Gray, Fl. i. 534. From New Mexico and Colorado to Oregon and California.

3. **M. dispersa,** Watson. Very similar, but the *leaves sinuate-toothed, sometimes entire,* rarely pinnatifid, the uppermost often ovate: *seeds somewhat cubical and very nearly smooth.* — Proc. Am. Acad. xi. 115. *M. albicaulis,* var. *integrifolia,* Watson. From Colorado through Idaho to Washington Terr. and California.

* * * *Seeds numerous, suborbicular-winged or narrowly-margined: petals* 5 *or* 10, *often large and showy: outer filaments often petaloid: capsule broad, oblong: leaves as in the last.*

+ *Flowers vespertine, yellowish white.*

4. M. **ornata,** Torr. & Gray. Rough with short-barbed hairs: leaves oblong-lanceolate, *the segments rather acute: flowers very large,* terminating the branches, *bracteolate:* petals 10, about 2 inches long: *filaments all filiform: capsule* 5 *to* 7-*valved at the summit:* seeds scarcely margined. — Fl. i. 534. Along the Missouri and its tributaries; also in S. W. Colorado.

5. **M. nuda,** Torr. & Gray. Rough with minute barbed pubescence: leaves somewhat lanceolate, *the segments obtuse: flowers about half the size of the last, not bracteolate:* petals 10: *exterior filaments petaloid and often sterile: capsule* 3-*valved at the summit:* seeds plainly winged. — Loc. cit. 535.

+ + *Flowers expanding only in bright sunshine, bright yellow: leaves lanceolate.*

6. **M. lævicaulis,** Torr. & Gray. Stout, 2 *or* 3 *feet high: flowers sessile* on short branches, *very large: calyx-tube naked:* petals acute at each end, 2 *to* 2½ *inches long:* seeds very minutely tuberculate. — Loc. cit. W. Wyoming and Montana to the Columbia River and S. California.

7. **M. pumila,** Torr. & Gray. Rather stout, 8 *to* 10 *inches high:* lower leaves somewhat petioled: *flowers small, solitary or three together,* terminating

the loose flowering branches, *slightly pedicellate, with* 1 *or* 2 *bracts at base:* outer filaments flat. — Loc. cit. *M. Wrightii* of Fl. Colorado. S. Colorado, southward and westward.

8. **M. chrysantha,** Engelm. Stems 1 *to* 2 *feet high,* branching: leaves ovate-lanceolate, the lower narrowed towards the base: flowers subsessile: *petals* 6 *to* 9 *lines long,* acute, often less than 10, the innermost smaller and antheriferous: *seeds* narrowly margined but *not winged.* — Brandegee's Fl. S. W. Col. 237. Differs from *M. pumila* in its larger flowers and seeds not winged. Near Cañon City, Colorado, and S. Utah.

9. **M. multiflora,** Gray. *Stems scabrous, pubescent, a span to a foot high:* leaves attenuate below: *flowers more numerous, subtended by* 1 *or* 2 *bracts: petals deep yellow, abruptly pointed,* 6 to 9 lines long. — Pl. Fendl. 48. Colorado and southward.

ORDER 33. CUCURBITACEÆ. (GOURD FAMILY.)

Herbs, mostly tendril-bearing and climbing, rather succulent, with alternate and palmately veined or lobed leaves and no proper stipules, flowers monœcious or diœcious, with petals more commonly united into a cup or tube and also blended with the calyx. Sterile flowers with two 2-celled anthers and one 1-celled; the cells usually long and contorted. Fertile flowers with the calyx-tube adnate to a 1 to 3-celled ovary.

1. **Cucurbita.** Flowers all solitary, large, yellow. Corolla 5-cleft. Fruit smooth, indehiscent, 1-celled, many-seeded.
2. **Echinocystis.** Sterile flowers in compound racemes, small, greenish white. Corolla 6-parted. Fruit prickly, bursting at the top, 2-celled, 4-seeded.

1. CUCURBITA, L. PUMPKIN, SQUASH, ETC.

Flowers monœcious. Calyx-tube and corolla campanulate. Sterile flowers with the stamens at the base. Fertile flowers with 3 rudimentary stamens: ovary oblong, with 3 placentæ. Fruit fleshy, often with a hard rind. Seed ovate or oblong, flattened. — Mostly prostrate and rooting at the joints: leaves cordate: tendrils compound.

1. **C. perennis,** Gray. Root fleshy, very large, 6 inches to 3 feet thick, yellow inside: leaves cordate-ovate or triangular, undivided or subsinuate-repand, margin denticulate: fruit globose, yellow, 2 or 3 inches in diameter. — Pl. Lindh. 193. From Colorado to Texas and Mexico, and westward to California.

2. ECHINOCYSTIS, Torr. & Gray. WILD BALSAM-APPLE.

Flowers monœcious. Petals united at the base into an open spreading corolla. Fruit fleshy, at length dry. — Tall climbing plants, nearly smooth, with 3-forked tendrils, thin leaves, fertile flowers in small clusters or solitary, from the same axils as the sterile.

1. **E. lobata,** Torr. & Gray. Root annual: leaves deeply and sharply 5-lobed: fruit oval, 2 inches long: seeds flat, dark-colored. — Colorado and eastward, in rich soil, to New York and Canada.

Order 34. CACTACEÆ. (Cactus Family.)

Green fleshy and thickened persistent mostly leafless plants, of peculiar aspect: globular or columnar, tuberculated or ribbed, or jointed and often flattened, usually armed with bundles of spines from the *areolæ*. Flowers with numerous sepals, petals, and stamens, usually in many rows, the cohering bases of all of which coat the inferior one-celled many-ovuled ovary, and above it form a tube or cup, nectariferous at base. Style one, with several or numerous stigmas. Fruit a pulpy or rarely dry one-celled berry.

§ 1. No leaves proper: spines never barbed. Flower-bearing and spine-bearing areolæ distinct. Tube of the sessile solitary flowers well developed, often long. Seeds brown or black, mostly small. — Cacteæ.

1. **Mamillaria.** Globose or oval plants, covered with spine-bearing tubercles. Flowers from between the tubercles. Ovary naked.

2. **Echinocactus.** Globose or oval plants, stouter than the last, usually ribbed: bundles of spines on the ribs. Flowers from the youngest part of the ribs close above the nascent bunches of spines. Ovary covered with sepals.

3. **Cereus.** Oval or columnar plants, sometimes tall, ribbed or angled: bundles of spines on the ribs. Flowers close above the bundles of full grown (older) spines. Ovary covered with sepals.

§ 2. Leaves small, subulate, early deciduous. Sessile and solitary flowers from the same areolæ as the always barbed spines. Tube of the flowers short, cup-shaped. Seeds larger, whitish, covered with a bony arillus. — Opuntieæ.

4. **Opuntia.** Branching or jointed plants: joints flattened or cylindrical.

1. MAMILLARIA, Haw.

Flowers about as long as wide: the tube campanulate or funnel-shaped. Ovary often hidden between the bases of the tubercles, the succulent berry exsert. Seeds yellowish-brown to black.

1. **M. vivipara,** Haw. Simple or cespitose: the almost terete tubercles bearing *bundles of* 5 *to* 8 *reddish-brown spines, surrounded by* 15 *to* 20 *grayish ones* in a single series, all straight and very rigid: *flowers purple*, with lance-subulate petals and fringed sepals: *berry oval, green:* seed pitted, light brown. — A variable species, ranging across the plains and along the eastern slopes of the mountains.

2. **M. Missouriensis,** Sweet. *Smaller*, globose, simple, *with fewer* (10 *to* 20) *weaker ash-colored spines: flowers yellow: berries scarlet, subglobose:* seeds globose, pitted. — *M. Nuttallii*, Eng. Common along the eastern slopes of the mountains and upon the plains.

Var. **cæspitosa,** Watson. Cespitose, with 12 to 15 straight white spines: berry shorter than the tubercles, red. — Bibliog. Index, i. 403. *M. Nuttallii*, var. *cæspitosa*, Eng. Eastern slopes of the mountains of Colorado and southward.

2. ECHINOCACTUS, Link & Otto.

Flowers about as long as wide. Ovary covered with few (in ours) sepaloid scales, which are naked or woolly in their axils. Fruit succulent or dry, covered with the persistent scales, sometimes enveloped in copious wool, and usually crowned with the remnants of the flower. Seed obliquely obovate, black.

1. **E. Simpsoni,** Eng. Simple, globose or depressed, *with ovate tubercles bearing about* 20 *outer ash-colored spines and* 5 *to* 10 *stouter darker inner ones,* all straight and rigid: flowers yellowish green to purplish: berry dry, with few black tuberculated seeds. — From the eastern slopes of the Colorado mountains westward to Utah and Nevada.

2. **E. Whipplei,** Eng. & Big. Simple, globose or ovate, *with* 13 *to* 15 *compressed and interrupted ribs:* 7 *to* 11 *outer spines and* 4 *inner ones; the ivory-white upper ones longest, broadest, recurved or twisted; the lower shorter, darker and terete; the lowest middle one hooked:* flowers yellow: seeds large, minutely tuberculated. — From S. Colorado westward to S. California.

3. CEREUS, Haw.

Flowers about as long as wide or elongated. Scales of the ovary distinct, with naked or woolly axils, or almost obsolete and the axils spiny. Berry succulent, covered with spines or scales or almost naked. Seeds black. — Fruit often edible. Our species all belong to § Echinocereus, which includes low and usually cespitose plants, with numerous oval or cylindric heads, short flowers, green stigmas and spiny fruit, the seeds covered with confluent tubercles.

1. **C. viridiflorus,** Eng. Ovate or at length cylindrical, simple or sparingly branched, 1 to 2 inches high: *ribs about* 13: areolæ ovate-lanceolate: *spines* strictly radiating, 12 *to* 18, *with* 2 *to* 6 *superior setaceous ones, the rest lateral and longer, the lower frequently purplish brown, the others white,* central one often wanting, when present stouter, solitary, and variegated: flowers lateral towards the apex, *yellow, becoming green:* berries elliptical, small. — Pl. Fendl 50. Common in Colorado and southward.

2. **C. Fendleri,** Eng. Ovate-cylindrical, 3 to 8 inches high: *ribs* 9 *to* 12: areolæ rather crowded: *spines* very variable, *always bulbous at base, radial ones* 7 *to* 10, *straight or curved, white and brown, lower ones stronger, central one stout, curved above, dark brown, often elongated:* flowers lateral below the top, large, 2 to 3 inches in diameter, *of a deep purple color:* berry 1 to 1½ inches long, edible. — Pl. Fendl. 50. S. Colorado and southward.

3. **C. gonacanthus,** Eng. & Big. Ovate, simple or sparingly branched from the base, 7-*ribbed: areolæ large, orbicular, distant: spines robust, angled, straight or variously curved; radial ones* 8, *yellowish,* often blackish at base and apex, *the upper one much larger than the others,* nearly equalling the central one, *which is remarkably stout, angular, and channelled: flowers scarlet,* open day and night. — Pac. R. Rep. iv. 33, t. 5. S. Colorado and southward.

4. **C. phœniceus,** Eng. *Heads* 2 to 3 inches high, *generally forming dense hemispherical masses a foot or more in diameter: ribs* 9 *to* 11: *areolæ ovate-orbiculate,* somewhat crowded: *spines setaceous, straight, radial ones* 3 *to* 12,

upper ones a little shorter, *central ones* 1 *to* 3, *bulbous at base*, terete, a little stronger, lowest one longest. — Pac. R. Rep. iv. 34, t. 4. S. Colorado and southward.

5. **C. conoideus,** Big. Heads 3 to 4 inches high, few from one base, of unequal height, ovate, *acutish towards the apex, conoid: ribs* 9 *to* 11: *radial spines* 10 *to* 12, slender, rigid, upper ones 2 to 5 lines long, lateral ones 6 to 15 lines, *upper central spines hardly longer than the lateral ones, lower one* 1 *to* 3 *inches long, angular and often compressed.* — Pac. R. Rep. iv. 36. S. Colorado and southward.

6. **C. paucispinus,** Eng. Stem 5 to 9 inches high, 2 to 3 inches in diameter, ovate-cylindrical, sparingly branching or simple: *ribs* 5 *to* 7: *areolæ remote: spines strong,* 9 to 16 lines long, *dark-colored, radial ones* 3 *to* 6, central wanting or rare, stout, subangled. — Pac. R. Rep. iv. 34. S. Colorado and southward.

4. OPUNTIA, Tourn.

Petals spreading or rarely erect. Berry succulent or sometimes dry, marked with bristly or spiny areolæ, truncate. — Articulated much-branched plants, of various shapes, low and prostrate, or erect and shrub-like.

§ 1. *Joints compressed: rhaphe forming a prominent bony margin around the seed.*

* *Fruit pulpy.*

1. **O. Camanchica,** Eng. & Big. Large, prostrate, extensively spreading: *joints ascending,* 6 to 7 inches long, *suborbiculate:* areolæ remote, numerous, armed: *bristles straw-colored or brownish,* few: *spines* 1 *to* 3, *compressed, brownish,* paler at the apex, 1 *to* 3 *inches long, upper ones elongated, suberect, the others deflexed: berry* large, *ovate, widely umbilicate:* seeds angled, deeply notched at the hilum. — Pac. R. Rep. iv. 40. S. Colorado and southward.

2. **O. Rafinesquii,** Eng. *Joints deep green, prostrate, broadly obovate or orbicular: leaves spreading: bristles bright red-brown: spines few and small with a single strong one:* flowers sulphur-yellow, mostly with a red centre: *berry narrowed at the base, with a funnel-shaped umbilicus.* — Pac. R. Rep. iv. 43. From Colorado eastward across the plains to Wisconsin and Kentucky.

Var. (?) **fusiformis,** Eng. & Big. *Roots forming fusiform tubers:* bristles stout and yellowish brown: flowers smaller and with fewer sepals: seed larger and thicker. — Pac. R. Rep. iv. 43. From the Missouri southward across the plains.

* * *Fruit dry and prickly.*

3. **O. Missouriensis,** DC. Prostrate: *joints broadly obovate and tuberculate,* 2 *to* 4 *inches long: leaves minute; their axils armed with a tuft of straw-colored bristles and* 5 *to* 10 *slender radiating spines* 1 *to* 2 *inches long: flowers light yellow.* — Frequent on the plains and in the mountains, and extending eastward to Wisconsin.

4. **O. rutila,** Nutt. Prostrate, *with thick obovate or elongated joints,* 2 *to* 4 *inches long,* sometimes thick and almost terete: *areolæ close, armed with numerous slender reddish or gray flexible spines: flowers purple:* berry deeply umbilicate: seeds large, flat, broadly margined, ivory-white. — Torr. & Gray, Fl. i. 155. S. Wyoming to Utah and westward.

5. **O. fragilis,** Haw. *Joints small, ovate, compressed or tumid or even terete,* 1 *to* 1½ *inches long, fragile: larger spines* 4, *cruciate, mostly yellowish brown, with* 4 *to* 6 *smaller white radiating ones below;* bristles few: *flowers yellow:* fruit with 20 to 28 clusters of bristles, only the upper ones with a few short spines. — From the Upper Missouri and Yellowstone to New Mexico.

§ 2. *Joints cylindrical, more or less tuberculated: seed not margined.*

6. **O. arborescens,** Eng. Arborescent, 5 to 6 feet high (much higher farther south): branches numerous, verticillate, horizontal or pendulous: joints verticillate: tubercles cristate, prominent: spines 8 to 30, divaricately stellate: berry sub-hemispherical, tuberculate-cristate, yellow, unarmed. — Wisliz. Rep. 6. Abundant from Central Colorado southward.

Order 35. FICOIDEÆ.

A miscellaneous group, chiefly of fleshy or succulent plants, with mostly opposite leaves and no stipules; differing from *Caryophyllaceæ* and *Portulacaceæ* by having distinct partitions to the ovary and capsule; the stamens sometimes numerous, as in *Cactaceæ;* petals wanting in ours.

1. **Sesuvium.** Calyx-lobes 5, petaloid. Stamens 5 to 60. Capsule circumscissile. Succulent.
2. **Mollugo.** Sepals 5. Stamens 3 or 5. Capsule 3-valved. Not succulent.

1. SESUVIUM, L. Sea Purslane.

Calyx-tube turbinate; the lobes apiculate on the back near the top, membranously margined. Styles 3 to 5. Capsule ovate-oblong. — Smooth branching mostly prostrate herbs: leaves opposite, linear to spatulate, entire: flowers axillary and terminal, solitary or clustered.

1. **S. Portulacastrum,** L. Leaves linear-lanceolate to oblong-lanceolate: flowers sessile or pedicellate: calyx-lobes more or less purple: stamens many. — From California through Nevada and Colorado to New Mexico.

2. MOLLUGO, L. Carpet-weed.

Stamens hypogynous. Styles 3. Seeds longitudinally sulcate on the back. — Low and much branched, glabrous: leaves spatulate to linear-oblanceolate, entire, opposite and apparently verticillate: flowers mostly on long pedicels and axillary.

1. **M. verticillata,** L. Prostrate: pedicels umbellately fascicled at the nodes: capsule oblong-ovoid: seeds reniform, shining. — From Colorado to Arizona and New Mexico; also in California and the Atlantic States.

Order 36. UMBELLIFERÆ. (Parsley Family.)

Herbs, with small flowers in umbels, five epigynous stamens and petals, and two styles; the calyx adnate to the 2-celled ovary, which

contains one ovule in each cell; and the fruit splitting into a pair of dry seed-like indehiscent carpels. Stem commonly hollow. Leaves mainly alternate, mostly compound, often decompound, the petiole expanded or sheathing at base. Umbels usually compound, forming *umbellets*. The bracts under the general umbel form an *involucre*, under an umbellet an *involucel*. The enlarged base of the styles is the *stylopodium*, which is often surrounded by an epigynous disk. Each carpel has usually 5 longitudinal ribs: in the intervals are usually one or more longitudinal oil-tubes, or *vittæ*. The face by which the two carpels cohere is the *commissure:* a slender prolongation of the axis between them is the *carpophore;* this is apt to split into two branches, a carpel suspended from the tip of each.

I. Umbels irregularly compound, the flowers capitate in the umbellets. Oil-tubes obscure.

1. **Sanicula.** Leaves lobed and incised. Flowers polygamous, mostly yellow. Fruit covered with hooked prickles or tubercles.

II. Umbels regularly compound. Fruit without prominent secondary ribs and not furnished with hooked or barbed prickles.[1] Oil-tubes rarely wanting.

* Fruit more or less compressed laterally, broadly ovate or subglobose to elliptic-oblong, not broadly winged.

+– Seed with sides moderately incurved: carpophore 2-cleft: flowers yellow or white.

2. **Musenium.** Fruit ovate or ovate-oblong: ribs 5, filiform, slightly prominent: oil-tubes 2 or 3 in the intervals.

3. **Orogenia.** Fruit ovoid: ribs 5, the 3 dorsal ones filiform, the lateral thickened, corky and involute: oil-tubes obscure, 3 in each interval.

+– +– Seed nearly terete or but slightly concave on the face.

++ Fruit not prominently ribbed: carpophore bifid or 2-parted. Involucre and involucels usually present. Flowers white.

4. **Carum.** Fruit ovate or oblong: ribs filiform: oil-tubes solitary.

5. **Berula.** Fruit nearly globose, emarginate at base, with thickened epicarp: oil-tubes numerous and contiguous: leaflets ovate-oblong to linear, laciniately toothed.

++ ++ Fruit with 5 strong ribs: carpophore 2-parted.

= Involucre none: flowers yellow: leaves all simple.

6. **Bupleurum.** Fruit ovoid-oblong, with or without oil-tubes: leaves entire.

= = Involucres and involucels usually present: flowers white: leaves pinnate to pinnately decompound.

7. **Cicuta.** Fruit broadly ovate, with thick obtuse wings: oil-tubes solitary.

8. **Sium.** Fruit globular: ribs wing-like: oil-tubes 1 to 3 in the intervals.

* * Fruit somewhat compressed laterally, linear-oblong, with broad commissure, not winged: seed sulcate or reniform in section: carpophore 2-parted, persistent: flowers white.

9. **Osmorrhiza.** Fruit narrowly attenuate at base, hispid on the acutish angles: oil-tubes very obscure: seed sulcate on the face or somewhat involute: umbels nearly naked: leaflets ovate, cleft and toothed.

10. **Glycosma.** Similar, but fruit not attenuate at base, very rarely hispid: seed broadly sulcate.

[1] The introduced genus *Daucus* has the secondary ribs most prominent and armed with barbed or hooked prickles, and solitary oil-tubes under the wings or ribs. See foot-note, p. 121.

* * * Fruit more or less compressed dorsally, oblong to orbicular.

+– Fruit somewhat compressed dorsally: the dorsal ribs rather narrowly winged; the lateral wings broader, distinct: seed sulcate and concave.

11. **Ligusticum.** Dorsal ribs narrowly winged: oil-tubes several in the intervals, obscure: seed reniform in section: flowers white or yellow.

12. **Thaspium.** Dorsal ribs strong and winged: oil-tubes solitary in the intervals: seed orbicular and somewhat angled in section: flowers yellow.

+– +– Fruit much flattened dorsally.

++ Lateral wings broad, distinct; the dorsal more or less prominent: seed concave on the face or nearly flat.

13. **Angelica.** Dorsal wings narrower than the lateral: oil-tubes solitary: stout herbs, with white flowers and naked or nearly naked umbels.

14. **Archangelica.** Similar, but with stouter ribs, and 2 to 3 or more oil-tubes in each interval adhering to the loose seed.

15. **Cymopterus.** Dorsal wings as broad as the lateral ones: oil-tubes one to several in the intervals: low perennial herbs: flowers yellow or white: involucres present.

++ ++ Lateral wings coherent till maturity; dorsal ribs filiform: seed nearly flat on the face.

16. **Peucedanum.** Lateral wings thin: oil-tubes as long as the fruit: involucre none: low perennials: flowers yellow or white, not radiate.

17. **Heracleum.** Lateral wings thin: oil-tubes solitary, clavate, not reaching the base of the fruit: involucre deciduous: stout pubescent perennials, with white, often radiate flowers.

18. **Archemora.** Lateral wings thin, broad: oil-tubes solitary: involucre nearly none: smooth perennials, with white flowers and rather rigid leaves.

19. **Ferula.** Lateral wings corky, as thick as the fruit; dorsal ribs filiform: oil-tubes very numerous, mostly obscure.

20. **Polytænia.** Lateral wings corky, tumid, thicker than the fruit; back nearly ribless: oil-tubes two in the intervals.

1. SANICULA, Tourn. Sanicle. Black Snakeroot.

Calyx-teeth foliaceous, persistent. Fruit subglobose or obovoid: ribs obsolete: oil-tubes numerous. Seed hemispherical. — Smooth perennials, with nearly naked stems: leaves palmately divided; the lobes more or less pinnatifid or incised: umbels involucrate with sessile leafy usually toothed bracts; the bracts of the involucels small and entire.

1. **S. Marylandica,** L. Stem 2 to 3 feet high: leaves all 5 to 7-parted: sterile flowers numerous, on slender pedicels: styles elongated and conspicuous, recurved. — Colorado and W. Montana; common throughout the Atlantic States.

2. MUSENIUM, Nutt.

Calyx-teeth persistent. Petals obovate, with inflexed point. — Perennial, dwarf, rather fœtid, resiniferous herbs, with fusiform roots and a short caudex, or branching dichotomously from the base: leaves 2 to 3-pinnatifid: involucre none; involucels unilateral, of a few rather rigid narrow leaflets.

1. **M. divaricatum,** Nutt. Decumbent: *stem short, dichotomously branching from the base: leaves,* except the radical, *opposite, glabrous, shining, bipinnatifid;* divisions confluent with the *winged rhachis: flowers yellow: fruit somewhat glabrous;* oil-tubes filled with a strong terebinthine oil. — Torr. & Gray, Fl. i. 642. "Naked and arid hills of the Upper Missouri," *Nuttall.*

Var. **Hookeri,** Torr. & Gray. *Rhachis narrow: fruit scabrous.* — Loc. cit. *M. trachyspermum,* Nutt. From the Saskatchewan to the Upper Missouri, the Platte, and S. W. Montana.

2. **M. tenuifolium,** Nutt. *Acaulescent, erect and somewhat cespitose, of glaucous hue: leaves tripinnately divided;* segments linear: *flowers white: fruit nearly glabrous;* oil-tubes with a more aromatic oil than in the former species. — Loc. cit. "Rocky Mountains," *Nuttall.*

3. OROGENIA, Watson.

Calyx-teeth minute. Commissure with 2 to 4 oil-tubes: carpophore adnate to the carpels and forming a thick corky midrib dividing the hollowed face of the commissure longitudinally. — Dwarf, scarcely caulescent, glabrous: root tuberous: leaves radical, 1 to 2-ternate, with entire linear segments: umbel with few very short unequal rays.

1. **O. linearifolia,** Watson. Stem an inch or two above ground and very slender: leaves 2 or 3, upon filiform petioles, equalling the stem: umbels with 2 or 3 rays; umbellets 3 to 5-flowered: involucre none; involucels of 1 to 3 linear leaflets exceeding the rays. — Bot. King's Exp. 120, pl. 14. Wahsatch Mountains, on damp shaded ridges.

4. CARUM, L.

Calyx-teeth small. Stylopodium conical. — Smooth, erect, slender biennial herbs or acaulescent, with tuberous or fusiform fascicled roots: leaves mostly simply pinnate with a few leaflets.

1. **C. Gairdneri,** Benth. & Hook. *Stem 1 to 4 feet high, from a tuberous root:* leaves few, *with 3 to 7 linear entire leaflets;* the lower leaves rarely pinnate with entire or toothed divisions; upper leaves usually simple: *involucre of a single linear leaflet,* or often wanting; *involucels of several linear bracts: flowers white.* — From Washington through Idaho to Wyoming, and thence to S. California. A common article of food among the Indians, who call it "yamp."

2. **C.** (?) **Hallii,** Watson. *Acaulescent* from a stout caudex branching at the summit: leaves pinnate or pinnatisect; *leaflets or segments oblong or subovate in outline, pinnately 3 to 7-lobed and few toothed: scape very simple, naked,* surpassing the leaves, 10 inches high: *involucel deeply parted: flowers yellow.* — Bibl. Index, i. 416. *Seseli Hallii,* Gray. *Musenium Greenei,* Gray. Colorado.

5. BERULA, Koch.

Calyx-teeth minute. Stylopodium conical and styles short. Commissure broad. Seed terete. — A smooth perennial aquatic: leaves pinnate: involucre and involucels of several leaflets.

1. **B. angustifolia,** Koch. Erect, ½ to 3 feet high, the stem stout and angled: leaflets about 6 pairs, ovate-oblong to linear, often laciniately lobed at base, and the upper ones especially more or less deeply cut-toothed: involucre and involucels of 6 to 8 entire linear-lanceolate leaflets. — *Sium angustifolium,* L. From Colorado northward, and eastward across the continent; also in California.

6. BUPLEURUM, Tourn. Thorough-wax.

Calyx-teeth obsolete. Fruit somewhat twin. — Herbs with simple entire leaves.

1. **B. ranunculoides,** L. Radical leaves linear-lanceolate; cauline ones clasping, cordate-oblong, striate: involucre about 3-leaved, unequal; leaflets of the involucel 5, ovate, mucronate. — Head-waters of Madison, Gallatin, and Snake Rivers.

7. CICUTA, L. Water Hemlock.

Calyx-teeth small, acute. Stylopodium depressed. Commissure narrow. — Smooth, tall branching marsh perennials, with stout hollow stems: umbels many-rayed: roots thick and fascicled, very poisonous: flowering in summer.

1. **C. maculata,** L. Stout, 3 to 6 feet high: lower leaves on petioles 1 or 2 feet long, *bipinnate; leaflets* oblong-lanceolate, *coarsely serrate: involucre usually wanting; involucels of* 6 *to* 8 *narrow lanceolate leaflets: flowers white:* fruit broadly ovate. — Across the continent from the Atlantic to Washington Territory and the Sierras.

2. **C.** (?) **trachypleura,** Watson. Stem a foot or more high, striate, 1 to 3-leaved, bearing 2 to 3 umbels on long peduncles: *leaves ternately decompound, segments filiform: involucre and involucels of* 1 *to* 3 *small subulate leaflets: flowers yellow:* fruit twin-ovate. — Bibl. Index, i. 417. *Thaspium trachypleurum,* Gray. Colorado.

8. SIUM, L. Water Parsnip.

Calyx-teeth obsolete (in ours). Stylopodium depressed and styles short. Commissure narrow. — Smooth perennial aquatics, with angled stems: leaves pinnate and leaflets serrate: involucre and involucels of several bracts: flowers white.

1. **S. cicutæfolium,** Gmelin. Tall: leaflets linear, lanceolate, or oblong-lanceolate, tapering to a sharp point. — *S. lineare,* Michx. From Colorado to the Saskatchewan and the Atlantic; also along the Pacific slope.

9. OSMORRHIZA, Raf. Sweet Cicely.

Calyx-teeth obsolete. Carpels 5-angled. Seed terete, sulcate on the face or with margins contiguous and enclosing a central cavity. — Perennials, with thick aromatic roots, more or less hirsute: leaves large, 2 to 3-ternately compound: involucre small or none.

1. **O. nuda,** Torr. Rather slender, 2 or 3 feet high, *more or less pubescent with spreading hairs:* umbel long-peduncled, 3 to 5-rayed, usually naked: *style and stylopodium very short.* — Pacif. R. Rep. iv. 93. From Colorado westward and along the coast from California to Alaska. Closely allied to the Eastern *O. brevistylis.*

2. **O. longistylis,** DC. Branching, 2 or 3 feet high: *leaflets sparingly pubescent* or smooth with age, short-pointed: *style slender, nearly as long as the ovary.* — From Dakota eastward across the continent.

10. GLYCOSMA, Nutt.

Stylopodium depressed: seed semiterete or angled, with rather a broad sulcus. — Involucre and involucels wanting.

1. **G. occidentale,** Nutt. Rather stout, 2 feet high or more, finely puberulent throughout, excepting the inflorescence: leaves 2-ternate; leaflets oblong-lanceolate, serrate. — Torr. & Gray, Fl. i. 639. *Myrrhis occidentalis,* Benth. & Hook. Head-waters of Snake and Yellowstone Rivers to Oregon and California.

11. LIGUSTICUM, L. Lovage.

Calyx-teeth obsolete. Stylopodium usually conical; margin of the disk undulate. Fruit with a broad commissure. — Smooth perennials, usually tall: leaves pinnately or ternate and pinnately decompound: umbels many-rayed, naked or involucrate.

* *Flowers white.*

1. **L. apiifolium,** Benth. & Hook. Stems 2 to 4 feet high, leafy or naked, with 2 to 4 umbels on long peduncles: *leaves pinnately decompound,* the segments incisely lobed; cauline leaves ternate, upon a short dilated sheath: *fruit* 2½ *lines long,* with a *conical stylophore: seed with a central longitudinal ridge on the concave face.* — Probably the *Conioselinum Canadense* of Hayd. Rep. 1872. Colorado and northward into Montana, but more abundant westward.

2. **L. scopulorum,** Gray. Very similar, but the fruit larger, 4 *lines long,* more broadly winged and ovate, and the *seed more depressed, almost reniform in section.* — Proc. Am. Acad. vii. 347. Colorado, alpine and subalpine.

3. **L. filicinum,** Watson. Rather slender, 1½ feet high: *leaves broadly triangular in outline, ternate, the divisions bipinnate, and the segments deeply pinnatifid with linear acute lobes: stylophore obscure: seed obscurely ridged on the back.* — Loc. cit. xi. 140. *L. apiifolium,* of Bot. King's Exp. In the Wahsatch and Uinta Mountains and Wyoming.

* * *Flowers yellow.*

4. **L. montanum,** Benth. & Hook. Very smooth: stem slender, 1 to 2 feet high: leaves 2-ternately divided; leaflets cuneiform, trifid; lobes oblong or lanceolate, sometimes linear, entire, or the larger ones incised. — Colorado and Arizona.

12. THASPIUM, Nutt. Meadow-Parsnip.

Calyx-teeth obsolete or short. — Perennial herbs, with 1 to 2-ternately divided leaves (or the root-leaves simple): umbels with no involucre and minute few-leaved involucels.

1. **T. trifoliatum,** Gray. Glabrous, stems somewhat branched: root-leaves or some of them round and heart-shaped; stem-leaves simply ternate or quinate, or 3-parted; the divisions or leaflets ovate-lanceolate or roundish, mostly abrupt or heart-shaped at the base, crenately toothed: flowers deep yellow. — Manual, 195. Colorado and northward into Montana, and eastward to the Atlantic States.

13. ANGELICA, L.

Calyx-teeth obsolete or minute. Stylopodium depressed Fruit ovate, with a very broad commissure. — Usually tall and stout perennials (ours are glabrous or nearly so): leaves pinnate or compound, the toothed segments usually broad. umbels many-rayed.

* *Involucre and involucels none.*

1. **A. pinnata,** Watson. Stem rather *slender, 2 to 3 feet high: leaves simply pinnate,* with a tendency to be bipinnate in the lower pair of leaflets; leaflets 1 to 6 inches long, ovate to narrowly lanceolate, *sharply and somewhat unequally serrate,* occasionally entire. — Bot. King's Exp. 126. Wahsatch and Uinta Mountains.

2. **A. Lyallii,** Watson. *Stout, 4 or 5 feet high: leaves ternate-quinate;* the leaflets lanceolate, *mostly cuneate at base, unequally dentate.* — Proc. Am. Acad. xvii. 374. From Montana to Oregon and the British boundary.

* * *Involucre and involucels conspicuous.*

3. **A. Dawsoni,** Watson. Rather slender, 1 to 3 feet high: radical leaves biternate, the lanceolate leaflets 1 or 2 inches long, sharply and finely serrate, the terminal one sometimes deeply 3-cleft: cauline leaves (1 or 2 or none) similar: umbel solitary, the conspicuous involucre of numerous foliaceous lacerately toothed bracts nearly equalling the rays; involucels similar. — Proc. Am. Acad. xx. 369. Rocky Mountains near the British boundary, and probably in N. Montana.

14. ARCHANGELICA, Hoffm.

Calyx-teeth short. Seed becoming loose in the pericarp. — Much like *Angelica.*

1. **A. Gmelini,** DC. Stem a little downy at the summit, 1 to 3 feet high: leaves 2 to 3-ternately divided; leaflets ovate, acute, cut-serrate, glabrous: fruit oblong. — Colorado to Oregon and Behring's Straits; also along the New England coast.

15. CYMOPTERUS, Raf.

Calyx-teeth prominent or often small or obsolete. Stylopodium depressed. Fruit ovate or elliptical, obtuse or retuse. — Low and often cespitose, with a thickened root: leaves pinnately and finely decompound, with small narrow segments: umbels usually with both involucre and involucels.

* *Flowers yellow.*

1. **C. alpinus,** Gray. *Caudex cespitose: leaves pinnatisect;* pinnæ 3 to 5, approximate, 3 to 7-parted; *segments linear-lanceolate,* very entire, or the lower 2 to 3-cleft: *scape 2 to 4 inches high, bearing a subcapitate umbel* a little longer than the leaves: involucels 5 to 7-parted; segments equalling the golden flowers: wings of the fruit somewhat erose; *oil-tubes 1 or 2 in the intervals, 4 on the commissure.* — Am. Jour. Sci., II. xxxiii. 408. High alpine, from Colorado to Mentana.

2. **C. terebinthinus,** Torr. & Gray. *Shortly caulescent,* 6 to 18 inches high, *leafy at base: leaves* rather rigid, *thrice pinnate: leaflets a line long or*

less, linear-oblong, entire, or 1 to 2-toothed: involucre a single linear leaflet or wanting; involucels of several short bracts: *oil-tubes* 2 *to* 4 *in the intervals,* 4 *to* 10 *on the commissure.* — Fl. i. 624. *C. fœniculaceus,* Torr. & Gray. Colorado and northward, thence westward to California and Washington.

* * *Flowers white.*

+ *Peduncles shorter (sometimes longer in No.* 3) *than the leaves.*

3. **C. montanus,** Torr. & Gray. *Root long and fleshy: stem* 2 *to* 6 *inches high: leaves glaucous,* ovate in outline, *bipinnately divided;* segments rather few and distant: *involucre and involucel somewhat companulate,* scarious, about 5-parted: flowers polygamous: *fruit with membranous wings; oil-tubes* 4 *on the commissure.* — Loc. cit. Colorado, northward and westward.

4. **C. glomeratus,** Raf. *Root thick and fusiform: stem* 3 *to* 8 *inches high;* caudex bearing the leaves and peduncles at the summit: *leaves on long petioles, ternately divided and bipinnatifid: leaflets of the palmately* 5 *to* 7*-parted involucre coherent at base and partly adnate to the rays of the umbellets: fruit with thickened and somewhat spongy wings; oil-tubes* 3 to 4 in the intervals, *about* 8 *on the commissure.* — Colorado and northward, also eastward along the Missouri and Arkansas Rivers.

5. **C. campestris,** Torr. & Gray. *Root tuberous: plant about* 2 *inches high: leaves* 3*-parted, the divisions remote, bipinnatifid: involucels minute: fruit with somewhat thickened and spongy wings,* the alternate ones obsolete; *oil-tubes* 6 *on the commissure.* — Loc. cit. "Plains of the Platte near the Rocky Mountains" (*Nuttall*).

+ + *Peduncles equalling the leaves or longer.*

6. **C. (?) anisatus,** Gray. Acaulescent, cespitose from a much-branched caudex, *glabrous:* leaves narrow, on long petioles, somewhat rigid, pinnate; *leaflets* 6 *to* 10 *pairs,* pinnately parted; segments entire or laciniately lobed, linear, *pungently acute:* involucre usually none; involucels of 6 to 8 linear leaflets: *fruit irregularly winged;* calyx-teeth conspicuous; *oil-tubes one in each narrow interval,* 2 to 4 on the commissure. — Proc. Acad. Philad. 1863, p. 63. Colorado, Nevada, and the Wahsatch.

7. **C. bipinnatus,** Watson. Cespitose, the short branches of the root-stock covered with the crowded remains of dead leaves, *glaucous, rough-puberulent:* leaves pinnate; *leaflets* 4 *or* 5 *pairs,* subequal, 3 to 5 lines long or less, pinnately divided; segments linear, entire or cleft into short linear lobes: scape 4 to 6 inches high, *much exceeding the leaves:* involucels of several linear-lanceolate leaflets: fruit nearly sessile, 1½ or 2 lines long; *wings thin, but somewhat corky,* narrow; *oil-tubes* 3 *or* 4 *in the rather broad intervals.* — Proc. Am. Acad. xx. 368. *C. fœniculaceus* of Hayd. Rep. 1871. Resembling *C. alpinus.* Mountains of Montana, *Hayden, Watson, Canby.*

16. PEUCEDANUM, L.

Calyx-teeth obsolete or slightly prominent. Disk and stylopodium small and depressed. — Perennials, with fusiform or tuberous roots, caulescent or acaulescent: umbels mostly involucellate: leaves pinnate to decompoundly dissected. — Watson, Proc. Am. Acad. xi. 121.

* *Leaves not finely dissected (rarely bipinnate), the segments large or broad or elongated: flowers yellow: fruit glabrous.*

+ *Acaulescent, glabrous: fruit oblong: leaves pinnate or bipinnate; leaflets narrowly linear.*

1. **P. graveolens,** Watson. Scape 6 to 18 inches high, a little exceeding the leaves: fruit 4 or 5 lines long, narrowly margined: oil-tubes about 2 in the intervals, 4 on the commissure. — Bot. King's Exp. 128. Mountains of Utah and Colorado, subalpine.

+ + *Caulescent: oil-tubes solitary: leaflets linear, entire.*

2. **P. simplex,** Nutt. *Finely puberulent,* often tall: *leaves ternate or biternate: fruit orbicular,* 3 to 6 lines long, emarginate at each end; *wings broader than the body;* ribs prominent. — From S. W. Montana to N. Arizona.

3. **P. ambiguum,** Nutt. *Glabrous,* often low: *leaves 1 to 2-pinnate with long leaflets,* the upper often more dissected: *fruit narrowly oblong,* 4 lines long, *narrowly winged;* oil-tubes 2 on the commissure. — Torr. & Gray, Fl. i. 626. W. Montana to Oregon and Washington. Root much used by the Indians.

* * *Leaves ample, very finely dissected with short filiform segments: flowers yellow: fruit glabrous.*

+ *Acaulescent, usually tomentose: fruit orbicular or broadly elliptical.*

4. **P. fœniculaceum,** Nutt. Sometimes even glabrous: involucels gamophyllous, 5 to 7-cleft: fruit 2 or 3 lines in diameter; ribs prominent; oil-tubes 1 to 3 in the intervals, 2 to 4 on the commissure. — Loc. cit. 627. From the Saskatchewan to Nebraska and the Indian Territory.

+ + *Caulescent, glabrous: fruit oblong.*

5. **P. bicolor,** Watson. Stem short: peduncle elongated: rays few, very unequal: involucel of a few linear bractlets: fruit narrowing from near the base, narrowly winged; ribs filiform; oil-tubes obscure. — Bot. King's Exp. 129. Wahsatch Mountains.

* * * *Leaves smaller, much or finely dissected with small segments: flowers yellow: fruit pubescent: low, acaulescent.*

6. **P. villosum,** Nutt. More or less densely pubescent: leaves of very numerous crowded narrow segments: umbels dense in flower: fruit oval, 3 or 4 lines long; oil-tubes several in the intervals. — From Nebraska to W. Nevada and S. Utah.

* * * * *Leaves much dissected with small segments: flowers white: fruit glabrous: usually low, somewhat cauiescent or scarcely so.*

7. **P. macrocarpum,** Nutt. More or less pubescent: *involucels conspicuous: fruit* 4 *to* 10 *lines long,* 2 or 3 wide; *calyx-teeth evident; ribs filiform;* oil-tubes rarely 2 or 3 in the intervals, 2 to 4 on the commissure. — Torr. & Gray, Fl. i. 627. From the Saskatchewan to Washington Territory and N. California.

8. **P. nudicaule,** Nutt. Nearly glabrous: *involucels small:* fruit elliptical, 2 *or* 3 *lines long; calyx-teeth obsolete; ribs prominent;* oil-tubes always solitary, 2 to 4 on the commissure. — Loc. cit. Nebraska and N. Colorado.

17. HERACLEUM, L. Cow Parsnip.

Calyx-teeth small or obsolete. Disk undulate; stylopodium conical. Fruit orbicular or elliptical; oil-tubes 2 on the commissure: seed flat and thin. — Leaves ample, compound: umbels many-rayed: involucels many-leaved.

1. **H. lanatum,** Michx. A very large strong-scented plant, 4 to 8 feet high, woolly: stem grooved: leaves 1 to 2-ternately compound; leaflets somewhat heart-shaped. — From Colorado to British America and eastward to the Atlantic; also in California.

18. ARCHEMORA, DC. Cowbane.

Calyx 5-toothed. Fruit oval, flattish; ribs approximated and equidistant on the convex back; oil-tubes 4 to 6 on the commissure. — Leaves pinnate, with 3 to 9 lanceolate or linear leaflets: involucels of numerous small leaflets.

1. **A. Fendleri,** Gray. Root fasciculate-tuberose; tubers 3 to 4, about an inch long: stem simple, 1 to 2 feet high: leaflets of the radical and lower cauline leaves ovate or oblong, all incisely serrate throughout: fruit hardly 2 lines long. — Pl. Fendl. 56. Colorado and New Mexico.

19. FERULA, L.

Calyx-teeth obsolete. Disk small and stylopodium depressed. Fruit oblong-elliptical or nearly orbicular. — Smooth, nearly acaulescent perennials, with thick fusiform roots: leaves pinnately decompound: flowers yellow, in many-rayed umbels.

1. **F. multifida,** Gray. Stems 1½ to 2 feet high, stout, naked or with 1 or 2 leaves: segments of the 3 to 4-pinnate leaves incisely pinnatifid, with narrow or linear lobes: flowers dull yellow or brownish. — Proc. Am. Acad. vii. 348. In the Wahsatch, W. Montana, Idaho, and Oregon.

20. POLYTÆNIA,[1] DC.

Calyx 5-toothed. Fruit oval, very flat; many oil-tubes in the corky margin. — A smooth herb, with 2-pinnate leaves, the uppermost opposite and 3-cleft: involucels bristly: flowers bright yellow.

1. **P. Nuttallii,** DC. Plant 2 or 3 feet high, with rather a stout sulcate stem which is usually scabrous and leafy: leaves mostly on long petioles, the segments pinnately incised or toothed: fruit 3 lines long, entire at each end. — Plains of the Platte and eastward to Indiana and Louisiana.

Order 37. ARALIACEÆ. (Ginseng Family.)

Like *Umbelliferæ*, but the umbels not regularly compound, stems apt to be woody, styles and carpels more than two, and the fruit fleshy (berry-like or drupaceous).

1. **Aralia.** Petals imbricated. Ovary 2 to 5-celled. Pedicels jointed. Ours not prickly.
2. **Fatsia.** Petals valvate. Ovary 2 to 3-celled. Pedicels not jointed. Very prickly throughout.

[1] The introduced *Daucus Carota*, L., may be known by its bristly stem, pinnatifid involucre which equals the dense and concave umbel, white or cream-colored flowers, the central one of each umbellet being abortive and dark purple.

1. ARALIA, L. Spikenard.

Calyx 5-toothed or entire. Petals 5, ovate. Stamens 5. Disk depressed or rarely conical. Ovary 2 to 5-celled: styles free or connate at base, at length divaricate. Fruit laterally compressed, becoming 3 to 5-angled. — Perennial herbs or shrubs: leaves alternate, digitate or compound, with serrate leaflets: umbels mostly simple, solitary, racemed or panicled.

1. **A. racemosa,** L. *Herbaceous:* stem widely branched: *leaves very large,* quinately or pinnately decompound; *leaflets cordate-ovate, doubly serrate:* umbels very numerous in a large compound panicle. — Base of the Rocky Mountains, *Dr. James,* and from Canada to Georgia.

2. **A. nudicaulis,** L. *Stem somewhat woody,* short, scarcely rising out of the ground, *bearing a single long-stalked leaf and a shorter naked scape,* with 2 to 7 umbels: *leaflets oblong-ovate or oval, serrate,* 5 on each of the 3 divisions. — In the Rocky Mountains, and from Canada to the Southern States.

2. FATSIA, Dene. & Planch.

Woody plant, with very large leaves palmately lobed, and the capitate umbels in a long raceme.

1. **F. horrida,** Benth. & Hook. Stem stout and woody, 6 to 12 feet long, creeping at base, leafy at the summit, and very prickly throughout, making the forests in places almost impassable. — Cascade and Coast Ranges, from the Columbia northward, and extending into the Bitter-Root Mountains.

Order 38. CORNACEÆ. (Dogwood Family.)

Trees or shrubs, rarely herbs, with simple and entire mainly opposite leaves, no stipules, and flowers in cymes or involucrate heads; petals and stamens 4 and epigynous; calyx adherent to the 1 to 2-celled ovary, which becomes a 1 to 2-seeded drupe or berry.

1. CORNUS, L. Dogwood. Cornel.

Flowers perfect. Calyx minutely 4-toothed. Petals oblong or ovate, valvate. Style slender: stigma capitate or truncate. — Shrubs or perennial herbs: flowers white or greenish.

1. **C. Canadensis,** L. *Stems low and simple, 5 to 7 inches high,* from a slender creeping trunk: leaves scarcely petioled, *the upper crowded into an apparent whorl* in sixes or fours, ovate or oval: *flowers greenish, in a head or close cluster, which is surrounded by a large and showy, 4-leaved, corolla-like, white or rarely pinkish involucre: fruit bright red.* — Colorado and northward, thence eastward across the continent.

2. **C. stolonifera,** Michx. *Shrub 3 to 6 feet high;* branches, especially the osier-like annual shoots, bright red-purple, smooth: leaves ovate, rounded at the base, abruptly short-pointed, *roughish with a minute close straight pubescence on both sides, whitish underneath: flowers white, in open and flat spreading cymes: involucre none: fruit white or lead-color.* — *C. pubescens* of Fl. Colorado and King's and Hayden's Reports. Same range as the last.

Division II. GAMOPETALÆ.

Perianth consisting of both calyx and corolla, the latter more or less gamopetalous, that is, with petals united.

Order 39. CAPRIFOLIACEÆ. (Honeysuckle Family.)

Shrubs, or rarely herbs, with opposite leaves, no stipules, the calyx-tube adnate to the 2 to 5-celled ovary, the stamens mostly as many as the lobes of the corolla and alternate with them, inserted on its tube or base. Flowers commonly 5-merous.

* Corolla regular, short, rotate or open-campanulate: style short or hardly any; stigmas 3 to 5: fruit baccate-drupaceous: inflorescence terminal and cymose.

← Herb, with stamens doubled and flowers in a capitate cluster.

1. **Adoxa.** Calyx with hemispherical tube adnate to above the middle of the ovary: limb about 3-toothed. Corolla rotate, 4 to 6-cleft. Stamens a pair below each sinus of the corolla, each with a peltate one-celled anther. Ovary 3 to 5-celled. Fruit greenish, maturing 2 to 5 cartilaginous nutlets.

← ← Shrubby to tree-like: stamens as many as corolla-lobes: inflorescence compound-cymose: anthers 2-celled: calyx 5-toothed.

2. **Sambucus.** Leaves pinnately compound. Corolla rotate or nearly so. Ovary 3 to 5-celled, forming small baccate drupes.

3. **Viburnum.** Leaves simple, sometimes lobed. Corolla rotate or open-campanulate. Ovary 1-celled and 1-ovuled, becoming a drupe.

* * Corolla commonly more or less irregular, elongated or at least campanulate: style elongated; stigma mostly capitate.

← Herbaceous, creeping, with long-pedunculate geminate flowers and dry one-seeded fruit, but a 3-celled ovary.

4. **Linnæa.** Calyx with a 5-parted limb, constricted above the globular tube. Corolla campanulate-funnelform, almost equally 5-lobed. Stamens 4, didynamous, included. Style exserted.

← ← Shrubs, with scaly winter buds, erect or climbing: fruit two to many-seeded.

5. **Symphoricarpos.** Calyx with a globular tube and 4 to 5-toothed limb. Corolla regular, not gibbous, from short-campanulate to salverform, 4 to 5-lobed. Ovary 4-celled. Fruit a globose berry-like drupe, containing two small and seed-like bony nutlets.

6. **Lonicera.** Calyx with ovoid or globular tube and a short 5-toothed or truncate limb. Corolla from campanulate to tubular, more or less gibbous at base; the limb irregular and commonly bilabiate, sometimes almost regular. Ovary 2 to 3-celled. Fruit a few to several-seeded berry.

1. ADOXA, L. Moschatel.

An anomalous genus in this order. Cauline leaves a single pair: a very small herb, a span or less high, with musky odor.

1. **A. Moschatellina,** L. Glabrous and smooth: radical leaves once to thrice ternately compound; cauline pair of leaves 3-parted or of 3 obovate and 3-cleft or parted leaflets: flowers small, greenish-white or yellowish, 4 or

5 in a slender-pedunculate glomerule: corolla of the terminal one 4 to 5-cleft, of the others 5 to 6-cleft. — Subalpine, Arctic America to Colorado and eastward in the Northern States.

2. SAMBUCUS, Tourn. Elder.

Plants with large pith to the vigorous shoots, serrate leaflets, small flowers in broad cymes, and red or black berry-like fruits. Stems with warty bark.

* *Compound cymes thyrsoid-paniculate; the axis continued and sending off several pairs of branches: pith of year-old shoots deep yellow-brown.*

1. **S. racemosa,** L. Stems 2 to 12 feet high; branches spreading: leaves from pubescent to nearly glabrous; leaflets 5 to 7, ovate-oblong to ovate-lanceolate, acuminate, thickly and sharply serrate: *thyrsiform cyme ovate or oblong:* flowers dull white, drying brownish: *fruit scarlet.* — *S. pubens,* Michx. In cool districts, across the continent.

2. **S. melanocarpa,** Gray. Glabrous, or young leaves slightly pubescent: leaflets 5 to 7, rarely 9.: *cyme convex, as broad as high:* flowers white: *fruit black,* without bloom: otherwise much like preceding. — Proc. Am. Acad. xix. 76. Ravines of the Rocky Mountains of Montana to Oregon, and south to New Mexico and California.

* * *Compound cymes depressed, 5-rayed; external rays once to thrice 5-rayed: pith of year-old shoots bright white.*

3. **S. Canadensis,** L. Plants 5 to 10 feet high, glabrous, except some fine pubescence on midrib and veins of leaves beneath: leaflets (5 to 11) mostly 7, ovate-oval to oblong-lanceolate, acuminate, the lower not rarely bifid or with a lateral lobe; stipels not uncommon, narrowly linear, and tipped with a callous gland: fruit dark purple, becoming black, with very little bloom. — From the S. Rocky Mountains eastward to Canada and Florida.

3. VIBURNUM, L.

Shrubs or small trees, with tough and flexible branches, simple leaves, and terminal depressed cymes of white flowers. — In our species the drupes are light red, globose, acid and edible, with the stone very flat, orbicular, and even, and the leaves palmately veined.

1. **V. pauciflorum,** Pylaie. Glabrous or pubescent, 2 to 5 feet high, straggling: leaves of roundish or broadly oval outline, unequally dentate, many of them either obsoletely or distinctly 3-lobed, about 5-nerved at base: cymes small, terminating short and merely 2-leaved lateral branches, involucrate with slender subulate caducous bracts, destitute of neutral radiant flowers. — Mountains of Colorado, northward and eastward in cold or mountainous regions.

4. LINNÆA, Gronov. Twin-flower.

A trailing and creeping evergreen, with filiform branches, purplish rose-colored sweet-scented flowers which are sometimes almost white.

1. **L. borealis,** Gronov. Somewhat pubescent: leaves obovate and rotund, ½ to 1 inch long, crenately few-toothed, somewhat rugose-veiny, tapering into a short petiole: peduncles filiform, terminating ascending short leafy branches,

bearing at summit a pair of small bracts, and from axil of each a filiform one-flowered pedicel: pedicels similarly 2-bracteolate at summit, and a pair of larger ovate glandular-hairy inner bractlets subtending the ovary: flowers nodding. — From the mountains of California, Colorado, and Maryland, northward to the Arctic Circle.

5. SYMPHORICARPOS, Dill. Snowberry. Indian Currant.

Low and branching shrubs, erect or diffuse, not climbing; with small and entire short-petioled leaves, and 2-bracteolate small white or pinkish flowers. — Fruit in ours white, and the style glabrous.

* *Short-flowered: corolla urceolate- or open-campanulate, only 2 or 3 lines long: flowers in terminal and upper axillary clusters, or solitary in some axils.*

1. **S. occidentalis,** Hook. *Robust,* glabrous, or slightly pubescent: leaves oval or oblong, thickish (larger 2 inches long): axillary flower-clusters not rarely pedunculate, sometimes becoming spicate and an inch long: *corolla 3 lines high, 5-cleft to beyond the middle, within densely villous-hirsute with long beard-like hairs: stamens and style more or less exserted.* — Mountains of Colorado and Montana, northward and eastward. "Wolf-berry."

2. **S. racemosus,** Michx. *More slender* and glabrous: leaves round-oval to oblong, smaller: axillary clusters mostly few-flowered, or lowest one-flowered: *corolla 2 lines high, 5-lobed above the middle, moderately villous-bearded within,* narrowed at base: *stamens and style not exserted.* — Across the continent. "Snowberry."

Var. **pauciflorus,** Robbins. Low, more spreading: leaves commonly only an inch long: flowers solitary in the axils of upper ones, few and loosely spicate in the terminal cluster. — Mountains of Colorado to those of Oregon, Vermont, and northward.

* * *Longer-flowered: corolla from oblong-campanulate to salverform, 5-lobed only at summit, 4 to 6 lines long: flowers mostly axillary.*

3. **S. oreophilus,** Gray. Glabrous or sometimes with soft pubescence: leaves oblong to broadly oval, ½ to ¾ inch long: corolla tubular or funnelform, its tube almost glabrous within, 4 or 5 times the length of the lobes: nutlets of the drupe oblong, flattened, attenuate and pointed at base. — Bot. Calif. i. 279. *S. montanus,* Gray. Mountains of Colorado, Utah, and Arizona, to California and Oregon.

6. LONICERA, L. Honeysuckle. Woodbine.

Erect or climbing shrubs; with leaves mostly entire, and the inflorescence various.

* *Flowers in pairs (or threes) from the axils of the leaves, the ovaries of the two either distinct or connate: stems erect and branching: corolla rather short.*

+ *Bracts at the summit of the peduncle very small, subulate: bractlets minute, rounded: berries red.*

1. **L. Utahensis,** Watson. Leaves oval or elliptical-oblong, rounded at both ends, very short-petioled, glabrous or nearly so from the first, or soon

glabrate, reticulate-venulose at maturity, 1 or 2 inches long: peduncles seldom over a half-inch long: corolla honey-yellow or ochroleucous, occasionally tinged with purple, ⅔ to ¾ inch long; the tube gibbous at base, pilose-pubescent within. — Bot. King's Exp. 133. Mountains of Utah, Montana, Oregon, and northward.

+ + *Bracts oblong to ovate or cordate and foliaceous; in fruit enlarging and enclosing or surrounding the two globose dark purple or black berries: bractlets conspicuous and accrescent.*

2. **L. involucrata,** Banks. Pubescent, sometimes glabrate, 2 to 10 feet high: leaves from ovate to oblong-lanceolate, 2 to 5 inches long, petioled: peduncles 1 or 2 inches long, sometimes 3-flowered: corolla yellowish, viscid-pubescent, a half-inch or more long: bractlets 4 or united into 2, viscid-pubescent. — Mountains of Colorado and California to Alaska, and extending eastward into Canada.

* * *Flowers in variously disposed terminal or axillary clusters, commonly verticillate: stems twining: uppermost pair or two of leaves connate into an oval or orbicular disk: corolla with more or less elongated tube: berries orange or red.*

3. **L. ciliosa,** Poir. Leaves ovate or oval, glaucous beneath, usually ciliate, otherwise glabrous: whorls of flowers single and terminal, or rarely 2 or 3, and occasionally from the axils of the penultimate pair of leaves, either sessile or short-peduncled: corolla glabrous or sparingly pilose-pubescent, yellow to crimson-scarlet; limb slightly bilabiate; lower lobe 3 or 4 lines long. — From the mountains of Arizona and California to those of Montana and British Columbia.

Order 40. RUBIACEÆ. (Madder Family.)

Shrubs or (ours) herbs, with opposite entire leaves connected by interposed stipules, or verticillate without apparent stipules, the calyx adnate to the 2 to 4-celled ovary, the stamens as many as the lobes of the regular corolla, and inserted on its tube.

* Leaves opposite, with entire interpetiolar stipules.

1. **Kelloggia.** Flowers generally 4-merous. Calyx with obovate tube and minute teeth. Corolla between funnelform and salverform. Stamens and style more or less exserted. Ovary 2-celled. Fruit small, dry and coriaceous, beset with hooked bristles, separating at maturity into 2 closed carpels.

* * Leaves verticillate, without stipules.

2. **Galium.** Flowers 4-merous, sometimes dicœcious. Calyx with globular tube and obsolete limb. Corolla rotate; lobes commonly with inflexed acuminate or mucronate tip. Stamens with short filaments. Style 2-cleft or styles 2. Ovary 2-celled, 2-lobed. Fruit didymous, dry (in ours), jointed on the pedicel, separating into two closed carpels, or only one maturing.

1. KELLOGGIA, Torr.

A single Californian species, most nearly allied in our flora to *Mitchella.*

1. **K. galioides,** Torr. Slender and glabrous or puberulent perennial, a span to a foot high: leaves opposite, lanceolate, sessile, with small and en-

tire or 2-dentate interposed stipules: fruit and paniculate inflorescence as in *Galium:* corolla white or pinkish, 2 or 3 lines long. — Mountain woods, mostly under coniferous trees, California and Arizona to Washington Territory and N. W. Wyoming.

2. GALIUM, L. Bedstraw. Cleavers.

Herbs (occasionally with suffrutescent base) with sessile leaves and small flowers variously arranged.

* *Woody at base: leaves* 4 *in the whorls; their margins, midrib, and angles of stem destitute of retrorse hispidness or roughness: fruit hirsute with long and straight* (*not at all hooked*) *bristles: flowers diœcious: stems low and diffuse.*

1. **G. Matthewsii,** Gray. Glabrous and smooth, paniculately much branched, woody at base: leaves rigid, lanceolate to ovate-lanceolate, veinless, with stout midrib, 2 or 3 lines long or more, some of the upper cuspidate-acute: flowers (of fertile plant) naked-paniculate: corolla barely a line in diameter: bristles of immature fruit rigid, not longer than the body. — Proc. Am. Acad. xix. 80. S. W. Colorado, New Mexico, and E. California.

* * *Wholly herbaceous: margins and midribs of the leaves and angles of the stem often retrorse hispid or rough: bristles on the fruit more or less hooked or none: flowers not diœcious.*

+– *Fruit beset with hooked bristles: leaves* 6 *or* 8 *in a whorl.*

2. **G. Aparine,** L. Stems 1 to 4 feet long, *retrorsely hispid on the angles, as also on the margins and midrib of the oblanceolate or almost linear* cuspidate-acuminate *leaves:* peduncles rather long, 1 to 3 in upper axils or terminal, *bearing either solitary or* 2 *or* 3 *pedicellate white flowers:* fruit not pendulous, granulate-tuberculate and the tubercles tipped with bristles. — From Texas to California and northward; eastward mainly as an introduced plant.

Var. **Vaillantii,** Koch. Smaller, more slender: leaves seldom an inch long: flowers usually more numerous: fruit smaller, hirsute or hispidulous. — Texas to California, Montana, and British Columbia.

3. **G. triflorum,** Michx. *Diffusely procumbent, smoothish:* herbage sweet-scented in drying: stems a foot to a yard long: leaves in sixes, *elliptical-lanceolate to narrowly oblong* (inch or two long), scabrous or not on the margins and midrib beneath: *cymes once or twice* 3*-rayed: pedicels soon divaricate:* corolla yellowish white to greenish, its lobes hardly surpassing the bristles of the ovary. — Across the continent.

+– +– *Fruit without hooked bristles: leaves* 4 *to* 6 *in a whorl.*

++ *Flowers very numerous and collected in a terminal and ample thyrsiform panicle: leaves in fours,* 3*-nerved, blunt.*

4. **G. boreale,** L. Erect, a foot or two high, mostly smooth and glabrous, very leafy: leaves from linear to broadly lanceolate, often with fascicles of smaller ones in the axils: flowers in a terminal panicle; the uppermost leaves being reduced to pairs of small oblong or oval bracts: fruit small, hispidulous, or at first canescent and soon glabrous and smooth. — From New Mexico and California north to Arctic regions and east to Canada.

++ ++ *Flowers few in number and scattered.*

5. **G. bifolium,** Watson. Smooth and glabrous, a span or two high, sparingly branched, slender: leaves oblanceolate to nearly linear, 4 *in the whorls, the alternate ones smaller, or uppermost nearly reduced to a single pair: flowers on solitary naked peduncles:* fructiferous peduncles about the length of the leaves, horizontal, and the *minutely hispidulous fruit decurved on the naked tip.* — Bot. King Exp. 134. Mountains of W. Colorado and S. Montana to California.

6. **G. trifidum,** L. Weakly erect, branching, 5 to 20 inches high, smooth and glabrous, except the retrorsely scabrous angles of the stem and usually more hispidulous and sparse roughness of the midrib beneath and margins of the leaves: *these in sixes, fives, or not rarely fours,* linear or oblanceolate, or lanceolate-oblong, obtuse, 4 to 7 lines long: peduncles slender, scattered, *one to several-flowered;* flowers often 3-merous, as commonly 4-merous: *fruit smooth and glabrous.* — From Texas to California, northward and eastward.

Var. **pusillum,** Gray, is the smallest form, a span or two high: leaves only in fours, 3 or 4 lines long, narrow, in age often reflexed: peduncles 1-flowered. — In the mountains of Colorado and California, and northward.

Var. **latifolium,** Torr. The larger and broadest-leaved form: leaves 6 or 7 lines long, often 2 lines wide: cymules few to several-flowered. — Canada to Texas and California.

Order 41. **VALERIANACEÆ.** (Valerian Family.)

Herbs with opposite leaves and no stipules, the calyx-tube adnate to the ovary, which has one fertile one-ovuled cell and two abortive or empty ones, stamens 1 to 3, distinct, fewer than the lobes of the corolla and inserted on its tube. — Corolla tubular or funnelform, mostly 5-lobed: flowers in terminal cymes.

1. VALERIANA, Tourn.

Calyx-limb of 5 to 15 setiform lobes, which are inrolled and inconspicuous until fruiting. Stamens 3. Roots of peculiar scent. Leaves various. Flowers white or rose-colored.

* *Erect from a large fusiform perpendicular stock branching below into deep and thickened roots: leaves thickish, nervosely veined, not serrate.*

1. **V. edulis,** Nutt. Glabrous or glabrate, a foot or at length 3 feet or more high: radical leaves oblanceolate to spatulate, tapering into a margined petiole, entire or some sparingly laciniate-pinnatifid; cauline rarely none, commonly 1 to 3 pairs, sessile, and pinnately parted into 3 to 7 linear or lanceolate divisions, or terminal one spatulate: flowers polygamo-dioecious, yellowish white, sessile in the cymules, which form an elongated thyrsiform naked panicle. — Mountains of New Mexico and Arizona, northward and eastward.

* * *Erect from creeping or ascending rootstocks, which emit slender roots: leaves thinnish, loosely veiny, often with some simple and some divided and margins either entire or dentate on same plant; the radical ones on slender naked petioles: corolla white to light rose-color.*

2. **V. sylvatica,** Banks. Stems from 8 to 30 inches high: radical leaves mostly simple and ovate to oblong, occasionally some 3 to 5-foliolate; cauline more or less petioled, 3 *to* 11-*foliolate* or parted, the divisions entire or rarely few-toothed: *fruiting cymes open,* at length thyrsoid-paniculate: *corolla* 2 *or* 3 *lines long.* — *V. dioica,* var. *sylvatica,* Gray. Mountains of New Mexico and Arizona, northward and eastward.

3. **V. Sitchensis,** Bong. *More robust,* from thicker and branching ascending rootstocks: *leaves larger;* cauline short-petioled, *only* 3 *to* 5-*foliolate;* the divisions orbicular to oblong-ovate, or in the upper leaves ovate-lanceolate, not rarely dentate or repand: *cymes contracted:* corolla funnelform, 4 *lines long.* — Northern Rocky Mountains and northward.

Order 42. COMPOSITÆ. (Composite Family.)

Flowers in a close head on a common receptacle, surrounded by an involucre, with (5 or 4) stamens inserted on the corolla, their anthers united in a tube. — Calyx-tube adnate to the 1-celled ovary, the limb (*pappus*) crowning its summit in the form of bristles, awns, scales, etc., or even absent. Corolla strap-shaped (*ligulate*) or tubular. Style 2-cleft. Fruit an akene. — The flowers are perfect, monœcious, diœcious, or polygamous. Strap-shaped marginal flowers are the *rays;* heads with prominent rays and tubular flowers are *radiate;* and a head composed entirely of strap-shaped corollas is *ligulate.* The tubular flowers compose the *disk,* and a head with no rays is *discoid.* A head with all its flowers alike as to sex is *homogamous,* when unlike *heterogamous.* The leaves of the involucre are *scales;* and the bracts or scales which are often found upon the receptacle among the flowers are *chaff,* and when this is wanting the receptacle is *naked.*

Key to the Tribes.

Ser. I. Tubuliflorae. Corollas tubular and regular in all the hermaphrodite flowers.

Heads homogamous and discoid: flowers all hermaphrodite and never yellow: anthers not caudate at base.

Style-branches elongated, filiform-subulate, hispidulous throughout; stigmatic lines only near the base: leaves alternate. I. Vernoniaceæ.

Style-branches elongated, more or less clavate-thickened upward and obtuse, minutely papillose-puberulent, stigmatic only below the middle. II. Eupatoriaceæ.

Heads homogamous or heterogamous, discoid or radiate: flowers not rarely yellow: style-branches of hermaphrodite flowers with stigmatic lines extending either to the naked summit or to a more or less distinct pubescent or hispidulous tip or appendage.

Anthers not caudate at base: style-branches in hermaphrodite flowers flattened and with a distinct (but sometimes very short) terminal appendage: disk-corollas generally yellow: rays of same or different color.

III. ASTEROIDEÆ.

Anthers caudate: style-branches of hermaphrodite flowers slender, destitute of any terminal appendage, the stigmatic lines extending quite to (or vanishing near) the naked obtuse or truncate summit: leaves alternate: heads in our genera discoid. . . . . IV. INULOIDEÆ.

Anthers not caudate: style-branches with truncate or variously appendiculate pubescent or hispid tips: involucre not scarious: receptacle chaffy: pappus various or none, never of fine capillary bristles.

V. HELIANTHOIDEÆ.

Anthers not caudate: receptacle naked: pappus from chaffy to setiform or none: herbage often punctate with resinous or pellucid dots or glands: otherwise nearly as preceding. . . . . VI. HELENIOIDEÆ.

Anthers not caudate: receptacle naked or sometimes chaffy: involucre of dry and scarious bracts: style-branches mostly truncate: pappus coroniform, or of short scales, or none. . . . . VII. ANTHEMIDEÆ.

Anthers not caudate: receptacle naked: involucre little or not at all imbricated, not scarious. Pappus of numerous soft-capillary bristles.

VIII. SENECIONIDEÆ.

Anthers conspicuously caudate, and with elongated appendages at tip: style-branches short or united, destitute of appendage, stigmatic quite to the obtuse summit, mostly smooth and naked: involucre much imbricated: receptacle densely setose or fimbrillate, or favose: akenes thick and hard: pappus usually plurisetose. Heads never truly radiate.

IX. CYNAROIDEÆ.

Ser. II. LIGULIFLORÆ. Corollas all ligulate and flowers hermaphrodite.

Receptacle naked or chaffy: anthers not caudate: style-branches filiform, naked, stigmatic only toward the base. Herbage with milky juice.

X. CICHORIACEÆ.

Tribe I. VERNONIACEÆ. Corollas tubular, 5-lobed.

1. **Vernonia.** Heads several to many-flowered. Involucre of dry or partly herbaceous much imbricated bracts. Receptacle plane, naked. Corolla regularly 5-cleft into narrow lobes. Akenes mostly 10-costate, with truncate apex. Pappus double; the inner of rigid capillary bristles, outer a series of small scales.

Tribe II. EUPATORIACEÆ. Receptacle in most cases naked. Leaves either opposite or alternate.

* Akenes 5-angled: scales of the involucre mostly lax, from thin-membranaceous to herbaceous, nerveless or few-nerved, either imbricated or equal and about in one row.

2. **Eupatorium.** Heads few to many-flowered. Receptacle flat. Pappus wholly of scabrous capillary bristles which are mostly in one row, and indefinitely numerous.

* * Akenes 10-costate or striate: scales of the involucre regularly imbricated; the outer ones successively shorter.

← Scales of the involucre not herbaceous, conspicuously striate-nerved: corolla slender, 5-toothed at summit; the teeth mostly glandular: pappus a single series of bristles: leaves mostly not entire.

3. **Kuhnia.** Pappus conspicuously plumose. Scales of the involucre narrow, in few series. Leaves nearly all alternate.

4. **Brickellia.** Pappus from barbellate or subplumose to merely scabrous. Leaves opposite or alternate.

← ← Scales of the involucre somewhat herbaceous or partly colored, not conspicuously striate: corollas narrow, with gradually dilated throat and elongated lanceolate or linear spreading (rose-colored) lobes: pappus about a single series of capillary or stouter bristles: leaves punctate, entire.

5. **Liatris.** Heads few to many-flowered. Involucre spirally imbricate. Akenes slender or tapering from apex to base, pubescent. Pappus of firm and mostly equal bristles, from plumose to barbellate. Leaves alternate. Herbs, with heads in a terminal spike or raceme, sometimes becoming paniculate.

Tribe III. ASTEROIDEÆ. Heads with ligulate ray-flowers pistillate or rarely neutral, or with the flowers all hermaphrodite and tubular, or even dicœcious. Receptacle seldom chaffy. Pappus various, sometimes none. Leaves mostly alternate.

* Disk wholly of hermaphrodite flowers, of the same color as the ray (if present), mostly yellow; their corollas tubular with more or less ampliate throat and 4 or 5-lobed limb: receptacle not chaffy, flat or merely convex: involucre closely imbricated, mostly in several series.

← Pappus chaffy: heads radiate, small, paniculate or cymose-clustered: scales of the involucre mostly coriaceous, the outer successively shorter.

6. **Gutierrezia.** Involucre oblong-clavate or turbinate to campanulate. Receptacle from flat to conical, commonly alveolate o fimbrillate. Style-appendages mostly slender. Rays 1 to 8. Akenes short, obovate or oblong, terete or 5-angled.

← ← Pappus of a few (2 to 8) elongated awns or rigid caducous bristles: heads radiate or rayless, solitary at the end of the branches.

7. **Grindelia.** Heads many-flowered, hemispherical or at first globose: the scales numerous and narrow, imbricated in many series, firm and rigid, with more or less herbaceous tips. Style-appendages lanceolate or linear. Akenes short and thick, compressed or turgid, or the outer triangular, truncate, glabrous.

← ← ← Pappus double: the inner of numerous capillary scabrous bristles: the outer composed of minute short bristles or scales, which are sometimes even obsolete: heads mostly radiate, middle-sized, terminating the stem and branches.

8. **Chrysopsis.** Heads many-flowered, with rays numerous or wanting. Involucre campanulate or hemispherical, of narrow regularly imbricated scales. Style-appendages from linear-filiform to slender-subulate. Akenes from obovate to linear-fusiform, compressed or turgid.

← ← ← ← Pappus of numerous capillary scabrous bristles, simple, in one or more series: receptacle more or less alveolate and the alveoli often dentate: style-appendages from ovate-lanceolate to filiform: flowers yellow.

8. **Chrysopsis.** Species with outer pappus obscure or wanting would be sought here.

9. **Aplopappus.** Heads usually many-flowered, radiate, rarely discoid. Disk-corollas narrow, 5-toothed. Involucre usually (but not always) broad: the bracts with or without herbaceous tips. Akenes from turbinate to linear.

10. **Bigelovia.** Heads 3 to 30-flowered, destitute of rays, small. Involucre narrow: the bracts chartaceous or coriaceous, mostly destitute of foliaceous or herbaceous tips. Akenes narrow, terete or angled, hardly compressed, mostly at least 5-nerved. Pappus of somewhat equal bristles. Inflorescence not racemiform.

11. **Solidago.** Heads few- or several-, rarely many-flowered; mostly radiate, small, commonly in racemiform or spiciform clusters, sometimes fastigiate-cymose or in a thyrsus. Involucre narrow: its bracts mostly not herbaceous-tipped. Akenes terete or angulate, 5 to 12-nerved or costate. Pappus of equal elongated bristles.

* * Disk of hermaphrodite and mostly fertile flowers; their corollas mostly yellow: the ray not yellow, occasionally wanting: receptacle naked, flat or barely convex.

← Pappus a single series of long awns or of coarse and rigid bristles, or in the conspicuous ray chaffy.

12. **Townsendia.** Involucre broad, many-flowered, imbricated: the bracts lanceolate, with scarious margins and tips, outer usually shorter and inner more membranaceous. Receptacle broad. Style-appendages lanceolate. Akenes obovate or oblong, much compressed, and with thickish margins, those of the ray sometimes triangular. Awns or bristles of the pappus scabrous.

← ← Pappus of numerous capillary bristles, with or without a short outer series.

13. **Aster.** Involucre from hemispherical to campanulate, sometimes oblong or turbinate, imbricated in several or few series of unequal bracts, mostly in part herbaceous. Rays numerous, not very narrow. Style-appendages from slender-subulate to ovate-acute, commonly lanceolate. Akenes mostly compressed, 2 to 10-nerved, and the pappus mostly simple and copious, rarely distinctly double. Leafy-stemmed herbs, the greater part perennials.

14. **Erigeron.** Differs from *Aster* in the more naked-pedunculate heads, simpler involucre of narrow and erect equal bracts, which are never coriaceous, nor foliaceous or with distinct herbaceous tips, narrower and usually very numerous rays often occupying more than one series, very short and roundish style-appendages, small 2-nerved akenes, and more scanty or fragile pappus, in many with a conspicuous short outer series.

← ← ← Corolla of the numerous female flowers reduced to a filiform or short and narrow tube, wholly destitute of ligule.

15. **Conyza.** Heads small, many-flowered. Bracts of the campanulate involucre narrow, in 1 to 3 series. Female flowers much more numerous than the hermaphrodite; their filiform or slender tubular corolla truncate or 2 to 4-toothed at the apex. Pappus a single series of soft capillary bristles, sometimes an added outer series of short bristles.

* * * Heads discoid and unisexual: corolla of the fertile flowers filiform: pappus of capillary bristles.

16. **Baccharis.** Heads completely dicœcious, many-flowered. Involucre regularly imbricated. Receptacle mostly flat and naked, rarely chaffy. Flowers of the male heads with tubular-funnelform 5-cleft corolla: the female with corolla reduced to a slender truncate or minutely toothed tube. Akenes 5 to 10-costate. Pappus of the male flowers a series of scabrous and often tortuous bristles: of the fertile flowers of usually more numerous and fine bristles, and often elongated in fruit. Shrubby or herbaceous.

Tribe IV. INULOIDEÆ. Female flowers ligulate or filiform. Style-branches filiform or flattish. Pappus capillary or none. Involucre commonly dry or scarious. Ours do not have conspicuous rays, and are all floccose-woolly herbs.

* Involucre of few scarious bracts: receptacle chaffy; a bract subtending each female flower or akene: anthers sometimes only acutely sagittate or auriculate: the short style or style-branches not truncate.

17. **Evax.** Akenes from obcompressed to terete, sometimes minutely papillose or puberulent. Bracts of the female flowers from scarious to chartaceous. Hermaphrodite flowers sometimes fertile, destitute of pappus. Receptacle from barely convex to subulate.

* * Involucre of numerous more or less scarious bracts which are often colored or petaloid at the summit: receptacle not chaffy: anther-tails slender: style or style-branches mostly truncate.

18. **Antennaria.** Heads dicœcious, many-flowered. Involucre imbricated in many series. Male flowers with mostly undivided style and a rather scanty pappus of clavellate

or apically barbellulate or crisped bristles. Female flowers with oblong or narrower and terete or flattish akenes, and a copious fine-capillary pappus, the soft and naked bristles of which are commonly united at base, so as to fall in a ring. Low perennials.

19. **Anaphalis.** Heads dicœcious, but usually with a few hermaphrodite sterile flowers in the centre of the female heads. Pappus of male flowers of bristles little if at all thicker at the apex: of the female flowers not united at base but falling separately. Otherwise as in the preceding; the female plant differing from the following only in the sterility of the few central flowers.

20. **Gnaphalium.** Heads heterogamous, fertile throughout, of few or many series of female surrounding a smaller number of hermaphrodite flowers. Involucre imbricated in many series: the scarious and commonly partly woolly bracts with or without colored papery tips or appendages. Style of hermaphrodite flowers 2-cleft. Pappus of numerous merely scabrous capillary bristles, in a single series.

Tribe V. HELIANTHOIDEÆ. Female flowers ligulate and radiate, or the heads sometimes homogamous by their absence: disk-flowers all with regularly 4 to 5-toothed corolla. Leaves mostly opposite.

* Ray-flowers ligulate and fertile, the ligule mostly deciduous; disk-flowers hermaphrodite-sterile: akenes usually coriaceous; the style mostly entire: receptacle chaffy throughout, except in No. 24.

← Involucre double; exterior of 4 or 5 herbaceous or foliaceous plane bracts; interior of a single series of small bracts, which completely and permanently enclose the obovate or oblong more or less compressed smooth and glabrous akenes with a pericarp-like accessory covering, at length deciduous together: pappus none.

21. **Melampodium.** Fructiferous bracts commonly indurated, naked or unarmed. Receptacle convex or conical. Akenes more or less obovate and incurved.

← ← Involucre broad, of plane or barely concave bracts; innermost subtending obcompressed (mostly much flattened) akenes, but not enclosing nor embracing them.

↔ Ray-flowers and akenes in more than one series, and with elongated exserted deciduous ligules: the akenes falling free, or with only the subtending bract.

22. **Silphium.** Heads large, many-flowered. Involucre of thickish more or less foliaceous imbricated bracts; the innermost small and chaffy. Receptacle comparatively small, the central part somewhat turbinate in age: its chaffy bracts linear, flat, or involute around the abortive ovaries. Corollas of the ray with a long and spreading ligule on a very short tube; of the disk cylindrical-tubular. Akenes very flat and broad, imbricated in 2 or 3 series, completely free from the subtending bract and from those of adjacent male flowers, surrounded by a winged margin which is produced more or less beyond the summit on each side into a callous tooth or auricle. Pappus none or sometimes a pair of short rigid awns or teeth, with which the wing is confluently united.

↔ ↔ Ray-flowers and akenes in a single series, with very short or even obsolete ligules: akenes with 2 or 3 bracts of sterile flowers attached to their base on the inner side, which they take with them, and commonly also the subtending involucral bract, when they fall: heads small.

23. **Parthenium.** Fertile flowers 5, with obcordate or 2-lobed almost sessile concave ligule, or a truncate emarginate cup. Bracts of the involucre chartaceous or partly herbaceous, and the inner more scarious: those of the usually conical receptacle cuneate, tomentose at summit, partly enclosing the sterile flowers. Akenes oval or obovate, commonly pubescent, surrounded by a filiform callous margin, which is firmly coherent at base with the bases of the bracts of the contiguous pair of sterile flowers and of the subtending bract, at length tearing away from the akene; the summit bearing the marcescent corolla. Pappus of two chaffy awns or scales, or sometimes hardly any.

24. **Parthenice.** Fertile flowers 6 to 8, with ligule obsolete or reduced to 2 or 3 small teeth: sterile flowers 40 or 50, with funnelform corolla. Involucre of 5 somewhat herbaceous oval exterior bracts, and of 6 or 8 somewhat larger orbicular-obovate and

more scarious interior ones, these subtending the fertile flowers. Receptacle convex, with linear-oblong or spatulate chaffy bracts subtending the outer series of sterile flowers, but mostly minute or wanting to the inner flowers. Akenes oblong-obovate, glabrous, wingless, but acute-margined, with an incurved apiculation inserted by a very small base, falling away at maturity with the involucral and two receptacular bracts, but these readily separating. Pappus none, and corolla deciduous.

* * Fertile flowers apetalous, or with corolla reduced to a tube or ring around the base of the 2-parted style ; disk-flowers staminate, anthers slightly united and their short terminal appendage inflexed, the abortive style hairy only at the somewhat enlarged and depressed summit, the ovary a mere rudiment: pappus none (or a vestige in Nos. 26 and 27): heads small ; the flowers whitish or greenish.

← Head androgynous (rarely all male in No. 27), having few female flowers at the margin ; the more numerous male flowers all or most of them subtended by slender and commonly spatulate chaffy bracts: involucre open.

↔ Akenes turgid, mostly obovate or pyriform, marginless.

25. **Iva.** Female flowers 1 to 5, with or without the tube or cup representing a corolla. Akenes more or less obcompressed, glabrous, puberulent, or glandular: the terminal areola small.

26. **Oxytenia.** Female flowers about 5, wholly destitute of corolla. Involucre of about 5 dilated-ovate and rather rigidly acuminate bracts. Receptacle convex, small: the 10 to 20 sterile flowers subtended by slender chaffy bracts with cuneate-dilated tips. Akenes (immature) very villous, nearly pyriform, with large terminal areola bearing around the base of the style a fleshy annular disk. Lower part of the disk-flowers and their chaff beset with some villous hairs.

↔ ↔ Akenes flattened, obcompressed, wing-margined.

27. **Dicoria.** Female flowers one or two, wholly destitute of corolla: male flowers 6 to 12, with mere rudiments of ovary and style. Involucre of 5 oval or oblong herbaceous bracts ; and within one or two larger and broad thin-scarious bracts, subtending the fertile flowers, or these wanting in male heads. Receptacle small, flat, with a few narrow and hyaline chaffy bracts. Filaments monadelphous up to the lightly connected anthers. Akenes much surpassing the outer involucre, oblong, anteriorly flat, convex or somewhat angled dorsally, abruptly bordered by a thin-scarious pectinate-dentate wing or edge. Pappus rudimentary, of several small and setiform bracts.

← ← Heads unisexual, monœcious ; the fertile with solitary or 2 to 4 completely or nearly apetalous female flowers in a closed nutlet-like or bur-like involucre, only the style-branches ever exserted ; the sterile of numerous male flowers in an open involucre, the heads in a raceme or spike: akenes turgid-obovoid or ovoid, wholly destitute of pappus: flowers greenish or yellowish.

↔ Involucre of the sterile heads gamophyllous: the receptacle low, and abortive style with dilated apex radiately fimbriate.

28. **Ambrosia.** Involucre of the male flowers from depressed-hemispherical to turbinate, 5 to 12-lobed or truncate, herbaceous. Receptacle flat or flattish, usually with some filiform chaff among the outer flowers. Involucre to the solitary fertile flower nut-like, apiculate or beaked at the apex, and usually armed with 4 to 8 tubercles or short spines in a single series below the beak. Sterile heads spicate or racemose above the fewer fertile ones.

29. **Franseria.** Heads of male flowers as *Ambrosia*, or sometimes intermixed with the female. Fertile involucre 1 to 4-flowered, 1 to 4-celled, a single pistil to each cell, 1 to 4-rostrate, more or less bur-like, being armed over the surface with several or numerous prickles or spines (the spiny free tips of component bracts) in more than one series. Leaves mostly alternate.

↔ ↔ Involucre of the sterile heads polyphyllous: the receptacle cylindraceous.

30. **Xanthium.** Involucre of the globular sterile heads one or two series of small narrow bracts: receptacle distinctly chaffy, a cuneate or linear-spatulate chaffy bract partly enclosing each male flower: filaments monadelphous. Fertile heads a closed and ovoid bur-like 2-celled and 2-flowered involucre, 1 to 2-beaked at the apex, the surface

clothed with uncinate-tipped prickles: each flower a single pistil, maturing a thick ovoid akene, the two permanently enclosed in the indurated prickly involucre. Leaves alternate.

* * * Ray-flowers ligulate and fertile; the ligule with very short tube or none, persistent on the akene and becoming papery in texture: disk-flowers hermaphrodite and fertile, numerous, subtended or embraced by chaffy bracts; the corolla cylindraceous: leaves opposite and heads singly terminating the stem or branches.

← Leaves all or mostly entire, sessile: akenes of the disk compressed, all or some of them toothed or awned from the summit of the angles or edges.

31. **Zinnia.** Involucre campanulate or cylindraceous: its closely appressed-imbricated bracts dry and firm, broad, with rounded summit often margined. Receptacle becoming conical or cylindraceous: the chaffy bracts conduplicate around the disk-flowers. Lobes of the disk-corolla mostly velvety-villous. Pappus when present of erect awns or chaffy teeth. Rays showy.

← ← Leaves commonly serrate, slender-petioled: akenes not compressed.

32. **Heliopsis.** Involucre short, of nearly equal oblong or lanceolate bracts. Receptacle from high-convex to conical: the pointless chaffy bracts partly embracing the disk-flowers. Ligules large: disk-corollas glabrous. Akenes obtusely 4-angular, with broad truncate summit, wholly destitute of pappus.

* * * * Ray-flowers ligulate and either fertile or neutral, or even wanting, the ligule not persistent: disk-flowers hermaphrodite and fertile, subtended and sometimes enwrapped by the chaff: pappus a cup or crown, of teeth or awns from the 2 to 4 principal angles, or of a few stout bristles, or none.

← Receptacle high, from conical to columnar or subulate, at least in fruit.

33. **Echinacea.** Involucre imbricated in 2 or 3 or more series: its bracts lanceolate. Disk at first only convex, becoming ovoid and the receptacle acutely conical: chaffy bracts of the latter persistent, carinate-concave, acuminate into a rigid and spinescent cusp. Ligules rose-colored or rose-purple. Disk-corollas cylindraceous, with 5 erect teeth and almost no proper tube. Akenes acutely quadrangular, somewhat obpyramidal, with a thick coroniform pappus more or less extended into triangular teeth at the angles.

34. **Rudbeckia.** Involucre looser, spreading, more foliaceous. Disk from hemispherical or globose to columnar, and receptacle from acutely conical to cylindrical: its chaffy bracts not spinescent, but sometimes soft-pointed. Ligules yellow or partly brown-purple. Disk-corollas with a short but usually a manifest proper tube. Akenes 4-angled, prismatic. Pappus a coriaceous and often 4-toothed crown, sometimes none.

35. **Lepachys.** Akenes short and broad, compressed, acutely margined or sometimes winged at one or both edges, on a slender-subulate receptacle. Pappus a chaffy tooth over one or both edges, or none. Chaffy bracts of the receptacle conduplicate, with thickened and truncate summit, embracing and hardly surpassing the akenes, at length deciduous with them. Corollas of the disk with hardly any proper tube. Ligules, involucre, &c. of *Rudbeckia*.

← ← Receptacle from flat to convex, or in certain species conical: akenes not winged nor very flat, when flattened not margined or sharp-edged.

↔ Rays fertile: receptacle flat or merely convex: ray akenes commonly triquetrous or obcompressed: pappus persistent or none.

36. **Balsamorrhiza.** Akenes destitute of pappus, oblong: of the disk quadrangular and often with intermediate nerves. Involucre broad: the outer bracts foliaceous, sometimes enlarged. Chaff linear-lanceolate. Tuberous-rooted low herbs.

37. **Wyethia.** Akenes prismatic, large, 4-angled, or in the ray 3-angled and in the disk often flattened, also with intermediate salient nerves. Pappus a lacerate chaffy crown, or cut into nearly distinct scales, commonly produced at one or more of the angles into chaffy rigid awns or teeth. Involucre campanulate or broader, more or less imbricated: outer bracts often foliaceous. Chaff lanceolate or linear, partly embracing the akenes. Thick-rooted and large-headed herbs, with alternate leaves.

++ ++ Rays sterile, rarely wanting: akenes quadrangular-compressed or more turgid: chaffy bracts of the convex or conical receptacle embracing the akenes.

38. **Gymnolomia.** Pappus none or a minute denticulate ring: the truncate apex of the short akenes commonly at length covered by the base of the corolla, the tube of which is usually pubescent.

39. **Helianthus.** Pappus deciduous, of two scarious and pointed scales, mostly no intermediate ones. Akenes usually glabrous or glabrate. Tube of the disk-corollas short, and the throat elongated.

+ + + Receptacle flat, convex, or sometimes becoming conical: akenes of the disk either flat-compressed and margined or thin-edged, or if turgid some of them winged: pappus not caducous.

40. **Helianthella.** Rays neutral, rarely wanting. Pappus of delicate scales between the two chaffy teeth or awns which surmount the two acute margins of the akene, or these obsolete in age. Ovary often wing-margined, but mature akene not so.

41. **Verbesina.** Involucre campanulate or hemispherical, imbricated. Rays fertile, sometimes neutral or none. Akenes usually winged and flat, 2-awned, or in the ray 1 to 3-awned, with no intermediate scales, and even the awns sometimes wanting. Leaves apt to be decurrent as wings on the stem.

* * * * * Akenes obcompressed or sometimes terete, and the subtending chaffy bracts flat or hardly concave; otherwise as in the last section: heads many-flowered: leaves mostly opposite: style-tips of the disk-flowers produced into a cusp or cone: involucre double: receptacle flat or merely convex: rays in ours neutral.

+ Akenes never with retrorsely barbed awns.

42. **Coreopsis.** Involucre of two distinct series of bracts, all commonly united at the very base; outer foliaceous, narrower, and usually spreading; inner erect or incurved after blooming, each series commonly 8 in number. Rays about 8. Akenes flat, orbicular to linear-oblong, winged or wingless, truncate or emarginate at summit, bearing 2, rarely 3 or 4 naked awns, scales, or teeth, or sometimes destitute of pappus.

+ + Awns of the pappus when present retrorsely barbed or hispid.

43. **Bidens.** Bracts of the involucre distinct, or united only at the common base. Akenes neither winged nor beaked, 2 to 5-awned: the awns retrorsely hispid. Rays neutral, yellow or white, sometimes wanting.

44. **Thelesperma.** Bracts of the inner involucre united into a cup; outer of shorter and narrow bracts, connate at base with the inner. Chaff of the flat receptacle white-scarious. Rays about 8, cuneate-obovate. Disk-corollas with long and slender tube, and abrupt campanulate or cylindrical throat. Anthers wholly exserted. Akenes slightly obcompressed or terete, narrowly oblong to linear, marginless, beakless: the abrupt summit crowned with a pair of persistent and stout awns or scales, or sometimes pappus wanting. Leaves opposite.

* * * * * Ray-flowers ligulate and fertile, each subtended by a bract of the mostly one-seried involucre which more or less encloses its akene; disk-flowers hermaphrodite, but some or all of them sterile, their style-branches subulate and hispid: chaff always present between ray and disk flowers: pappus none to the ray-akenes, chaffy or else none to the disk-flowers: commonly glandular-viscid and heavy-scented herbs.

45. **Madia.** Heads many to several-flowered. Involucre ovoid or oblong, few to many-angled by the salient narrow backs of the involucral bracts. Receptacle flat or convex, bearing a single series of bracts enclosing the disk-flowers as a kind of inner involucre, either separate or connate into a cup. Ray-flowers 1 to 20, with cuneate or oblong 3-lobed ligules: their akenes laterally compressed, and enclosed in conduplicate-infolded involucral bracts.

46. **Layia.** Heads many-flowered, broad: ray-flowers 8 to 20, with 3-lobed or toothed ligules. Bracts of the involucre flattened on the back below, with abruptly dilated thin margins infolded so as to enclose the ray-akene. Receptacle broad and flat, bearing a series of thin chaffy bracts between the ray- and disk-flowers. Akenes of the ray obcompressed, almost always smooth, destitute of pappus; those of the disk similar or more linear-cuneate, mostly pubescent, bearing a pappus of 5 to 20 bristles, or scales, or rarely none.

Tribe VI. HELENIOIDEÆ. Disk-flowers hermaphrodite and fertile. Bracts of the involucre not scarious. Differing chiefly from the last tribe in entire absence of chaff.

* Involucre of narrow equal erect bracts: ligules persistent and becoming papery on the usually striate-nerved akenes: herbage more or less white-woolly; no oil-glands.

47. **Riddellia.** Heads with 3 or 4 ray- and 5 to 12 disk-flowers, all fertile. Involucre of 4 to 10 linear-oblong coriaceous woolly bracts, and a few smaller scarious ones within, sometimes an additional narrow outer one. Receptacle small, flat. Ligules as broad as long, abruptly contracted at base into a short tube, truncate and 2 to 3-lobed. Disk-corollas with short externally glandular-bearded teeth. Pappus of 4 to 6 hyaline scales.

* * Involucre of narrow equal erect bracts, in only one series: ray-flowers female or none, the ligule deciduous; disk-corollas 4-toothed: akenes flat, with only marginal nerves, usually much ciliate: plants not floccose-tomentose, and with no oil-glands.

48. **Pericome.** Head many-flowered, homogamous. Involucral bracts lightly connate by their edges into a campanulate cup. Disk-corollas with viscous-glandular tube and much exserted anthers. Akenes strongly villous-ciliate. Pappus a lacerate-ciliate crown, and sometimes a pair of short awns, one from each angle of the akene. Yellow-flowered, with long-acuminate leaves.

* * * Involucre hardly at all imbricated, its bracts when broad nearly equal or in a single series: ligules not persistent: disk-flowers numerous, mostly with 5 teeth: akenes few-nerved or angled, or more numerously striate-angled when turbinate or pyrfform: no oil-glands.

← Receptacle flat or convex: akenes from linear to obpyramidal, mostly quadrangular, rarely 5-angled: flowers all fertile.

↔ Involucre mostly hemispherical; the bracts from oblong or oval to broader, not colored or scarious-tipped.

49. **Eriophyllum.** Involucre of one or sometimes two series of oblong permanently erect bracts, either distinct or sometimes partially united into a cup, at least in fruit concave at centre, partially receiving the akenes. Receptacle from convex or rarely conical to plane. Ray-flowers usually with broad ligules, very rarely none. Akenes narrow, from clavate-linear to cuneate-oblong, mostly 4-angled. Pappus of nerveless and mostly pointless scales. Floccose-tomentose or rarely glabrate herbs.

50. **Bahia.** Involucre hemispherical or obovate and lax or open in fruit; the plane bracts distinct to and commonly narrower at the base, not embracing akenes. Receptacle mostly flat. Female flowers with exserted ligules, or rarely none. Akenes narrow, quadrangular. Pappus of several scarious scales. Not floccose-tomentose.

↔ ↔ Involucre broadly campanulate or turbinate; its bracts from linear-lanceolate and spatulate to obovate or broader, at least the tips membranaceous and colored or petaloid.

51. **Hymenopappus.** Involucre broadly campanulate; its bracts 6 to 12, equal, obovate to broadly oblong, thin. Ray-flowers none. Corolla with reflexed or widely spreading lobes. Akenes obpyramidal, 4 to 5-angled, with attenuate base, the faces 1 to 3-nerved, the nerves at maturity sometimes as prominent as the angles. Pappus of 10 to 20 thin-scarious and mostly hyaline obtuse scales.

52. **Polypteris.** Involucre from broadly campanulate to turbinate; its bracts from spatulate to linear-lanceolate, commonly in two series and equal. Rays in our species evolute into a palmate ligule and fertile. Corolla of the disk-flowers with long lobes. Stamens wholly exserted. Akenes from linear and downwardly attenuate to clavate-obpyramidal, 4-sided, minutely pubescent. Pappus of 6 to 12 equal hyaline-scarious scales.

↔ ↔ ↔ Involucre hemispherical or campanulate; its bracts linear, erect, herbaceous to the tip, inclined to embrace the akenes: heads discoid, or with an inconspicuous ligule.

53. **Chænactis.** Receptacle flat. Akenes slender, linear-tetragonal or more compressed, pubescent. Pappus of hyaline nerveless scales. Leaves mostly cleft or compound.

← ← Receptacle from convex to oblong: involucre of more than one series of bracts: akenes short, obpyramidal or turbinate, 5 to 10-costate or angled, mostly silky-villous or hirsute: disk-flowers all fertile.

↔ Receptacle destitute of awn-like fimbrillæ among the flowers.

54. **Actinella.** Involucre campanulate or hemispherical, or sometimes broader; its bracts in two or more series, erect, often rigid; outer sometimes united. Receptacle from conical to convex. Rays fertile. Pappus of 5 to 12 thin and mostly hyaline scales. Mostly low herbs, and bitter-aromatic.

55. **Helenium.** Bracts of the involucre spreading, subulate or linear. Rays fertile or sterile, rarely none. Disk-corollas with 4 to 5-toothed limb; the teeth obtuse, glandular-pubescent. Pappus of usually 5 or 6 thin scarious scales. Leaves commonly impressed-punctate, mostly decurrent.

↔ ↔ Receptacle (from convex to globular) beset with setiform or subulate fimbrillæ among the flowers.

56. **Gaillardia.** Involucre broad; the bracts in 2 or 3 series, all but the short inner series foliaceous and lax. Ray-flowers neutral; ligules 3-toothed or 3-cleft. Disk-corollas with 5 ovate-triangular to subulate teeth, which are beset with jointed hairs. Akenes turbinate, 5-costate, covered with long villous hairs. Pappus conspicuous, longer than the akene, of 5 to 10 hyaline-scarious scales with a costa mostly excurrent into an awn.

* * * * Involucre of the small heads composed of a few equal connivent bracts in a single series, sometimes one or two small additional ones at base: ligules small, not persistent: akenes terete, oblong or linear, 8 to 10-striate-costate: leaves opposite: no oil-glands.

57. **Flaveria.** Heads one to several-flowered: the flowers all fertile, homogamous and tubular, or one female and short-ligulate. Disk-corollas 5-toothed. Involucre of 2 to 5 mostly carinate-concave bracts. Pappus none.

* * * * * Involucre a series of equal bracts, either distinct or united into a cup or tube, dotted or striped with oil-glands: rays when present fertile; ligules not persistent: akenes mostly narrow and striate: pappus various: mostly glabrous and smooth herbs or undershrubs, strong-scented, the herbage like the involucre commonly dotted with some oil-glands.

58. **Dysodia.** Pappus multisetose-polyadelphous, i. e. all or most of the 10 or more scales resolved, except a basal portion, into several or indefinitely numerous capillary, but rather stiff bristles. Involucre hemispherical or campanulate, usually with a series of loose accessory bracts, the proper bracts generally more or less gamophyllous.

59. **Hymenatherum.** Pappus of several or numerous scales, either 1 to 5 aristate or pointed, or partly resolved into as many bristles, or some or all of them entire and even truncate. Involucre campanulate, gamophyllous high up, with or without some loose accessory bracts. Akenes mostly terete, and striate.

60. **Pectis.** Heads radiate, several to many-flowered. Involucre naked at base, or nearly so, cylindrical or campanulate, of few or several equal carinate bracts in a single series. Disk-corollas 5-lobed, one or two sinuses often deeper, thus becoming bilabiate. Akenes linear, terete or angled. Pappus of few or numerous bristles or awns, sometimes chaffy-dilated at base, or of scales. Opposite-leaved herbs.

Tribe VII. ANTHEMIDEÆ. Akenes usually small and short, with no pappus or a chaffy crown, or a circle of scales. Strong-scented or bitter-aromatic herbs or undershrubs, with alternate leaves. Distinguished from the former tribe chiefly by the scarious involucre.

* Receptacle with chaffy bracts: heads radiate.

61. **Leucampyx.** Involucre broadly hemispherical; its bracts broadly oval, equal, in 2 or 3 series of 4 or 5 each, their margins white-scarious. Ray-flowers 8 or 10, fertile; ligule cuneate-obovate, ample, on a slender glandular tube. Akenes large, obovate-trigonous, with narrowed base and rounded summit, lightly 5-nerved, glabrous, slightly incurved. Pappus an obscure crown, soon obsolete.

62. **Achillea.**[1] Involucre with imbricated bracts as in the last, but campanulate or obovate. Chaffy bracts of the receptacle membranaceous, like the innermost bracts of the involucre. Rays few or several, short and broad. Akenes oblong or obovate, obcompressed, glabrous, destitute of pappus.

* * Receptacle destitute of bracts or chaff.

+ Heads radiate, pedunculate, solitary at the summit of the branches, or sometimes corymbose.

63. **Matricaria.**[2] Receptacle conical or ovoid, or rarely lower when young. Akenes 3 to 5-ribbed or nerved on the face or sides, rounded on the back.

+ + Heads discoid.

64. **Tanacetum.** Heads corymbosely cymose or glomerate, rarely solitary, many-flowered; female flowers with tubular 3 to 5-toothed corolla. Akenes 5-ribbed or 3 to 5-angular, with broad truncate summit, bearing a coroniform pappus or none. Anther-tips broad and mostly obtuse.

65. **Artemisia.** Heads paniculately disposed, few to many-flowered, small, heterogamous, the female flowers with small and slender tubular corolla, and the hermaphrodite either sterile or fertile; or homogamous, with the flowers all hermaphrodite and fertile. Anther-tips slender and pointed. Akenes obovate or oblong, destitute of pappus.

Tribe VIII. SENECIONIDEÆ. Involucre mostly one or two series of equal bracts, sometimes unequal or imbricated, with or without accessory ones at base. Leaves usually alternate. Chiefly distinguished by the copious capillary pappus, simple involucre, and naked receptacle.

* Involucre a series of soft herbaceous bracts: heads subdiœcious, racemosely or corymbosely disposed, whitish flowered: herbs with ample mostly radical leaves.

66. **Petasites.** Akenes narrow, 5 to 10-costate, with elongating soft and white pappus.

* * Involucre lax (not erect-connivent), of much overlapping bracts (4 or 5), many- (at least 20-) flowered: herbs with opposite leaves.

67. **Haploesthes.** Heads radiate; flowers all fertile. Involucre short-campanulate, of similar rather fleshy orbicular or broadly oval bracts, the outer strongly overlapping the inner. Ligules of the rather few and short ray-flowers oval. Akenes linear, terete, striate-costate, glabrous. Pappus a single series of rather rigid and scabrous whitish bristles.

* * * Involucre of 4 to 6 firm and concave close and strongly overlapping bracts, 4 to 9-flowered: shrubs, with alternate leaves.

68. **Tetradymia.** Heads homogamous. Involucre cylindrical to oblong. Corollas with lanceolate or linear spreading lobes. Anthers wholly exserted. Akenes terete, short, obscurely 5-nerved, from extremely long-villous to glabrate or even glabrous. Pappus of fine and soft minutely scabrous capillary long bristles, white or whitish.

* * * * Involucre of numerous or several connivent-erect herbaceous equal bracts, many-flowered: herbs, with opposite or alternate leaves.

69. **Arnica.** Heads conspicuously radiate, or the rays rarely wanting. Involucre campanulate, of several thin-herbaceous oblong-lanceolate to linear equal bracts in a single

[1] The Old-World genus *Anthemis* has a naturalized species within our range and may be characterized as follows: —

Anthemis. Involucre hemispherical, many-flowered, of comparatively small imbricated bracts, the outer successively shorter. Chaffy bracts of receptacle sometimes hyaline, sometimes aristiform. Akenes terete or 4 to 10-angled or ribbed, not flattened, glabrous; the truncate summit naked, or with a very short coroniform or auriculate pappus. Heads comparatively large. — See p. 198.

[2] The following Old-World genus has a naturalized species within our borders: —

Chrysanthemum. Receptacle from flat to hemispherical. Akenes (at least of the disk) 5 to 10-ribbed or nerved all round. — See p. 199.

or somewhat double series. Corollas of the disk-flowers with a commonly elongated hirsute tube. Akenes linear, more or less 5 to 10-costate or angled. Pappus a single series of numerous rather rigid capillary bristles, from scabrous to barbellate. Leaves chiefly opposite.

70. **Senecio.** Heads heterogamous and radiate, or by the absence of ray homogamous and discoid. Corollas yellow. Pappus of soft-capillary and merely scabrous very numerous bristles. Leaves alternate.

Tribe IX. CYNAROIDEÆ. Heads homogamous and tubiflorous, the flowers all hermaphrodite, the corolla lobes long and narrow. Leaves alternate, the teeth or margins often prickly.

71. **Cnicus.**[1] Involucre of numerous much imbricated and often prickly-tipped bracts. Receptacle densely villous-setose. Bristles of the pappus long- and soft-plumose, connate into a ring at base and falling from the akene in connection. Leaves more or less prickly.

Tribe X. CICHORIACEÆ. Ligule 5-toothed at the truncate apex. Receptacle almost always plane. Herbs, mostly with milky and bitter juice, and alternate leaves. In ours the pappus is always present and the receptacle naked.

* Pappus chaffy or partly so, or bristle-like, or plumose.

72. **Krigia.** Heads several to many-flowered. Bracts of the involucre thin-herbaceous, equal. Akenes short-columnar, many-ribbed, terete or somewhat angular, with broad truncate summit. Pappus double; outer of pointless thin scales; inner of delicate naked bristles. Flowers yellow.

73. **Stephanomeria.** Heads 5 to 12-flowered, rarely 3 to 20-flowered. Involucre cylindraceous or oblong, of several appressed and equal plane membranaceous bracts and some short calyculate ones, not rarely with 2 or 3 of intermediate length, thus becoming imbricate. Akenes 5-angled or ribbed, sometimes with intermediate ribs. Pappus a series of plumose bristles, or rarely chaffy awns. Flowers pink or rose color.

74. **Microseris.** Heads several to many-flowered, on naked simple scapes or peduncles. Corollas mostly with a hairy tube. Akenes 8 to 10-costate, with a basal callosity which is hollowed at the insertion. Pappus simple white; its bristles or awns naked, with chaffy base, or plumose. Flowers yellow.

* * Pappus of capillary bristles, scabrous, never plumose nor chaffy.

+ Akenes not flattened: pappus deciduous, mainly all together, soft and white.

75. **Malacothrix.** Involucre many-flowered, either imbricated or only calyculate. Receptacle sometimes with or sometimes without delicate capillary bristles interposed among the flowers. Akenes short, oblong or columnar, glabrous, terete and striately 5 to 15-costate, or 4 to 5-angled by the prominence of stronger ribs, with broad truncate apex having an entire or denticulate border or sharp edge. Pappus a series of soft and scabrous bristles, and commonly 1 to 8 outer and stronger ones which are more persistent and smoother.

+ + Akenes not flattened: pappus persistent, or bristles falling never in connection.

++ Beak to the akenes none.

= Flowers yellow.

76. **Hieracium.** Involucre several to many-flowered, of narrow equal bracts and some short calyculate ones. Akenes oblong or columnar, smooth and glabrous, mostly 10-ribbed or striate, either terete or 4 to 5-angular, commonly of same thickness to the truncate top, but in several species tapering to a narrower summit. Pappus of rather

[1] The following Old-World genus has a naturalized species within our range: —

Arctium. Involucre globular; bracts slender-subulate or aristiform and spreading above the broader appressed base, hooked at tip. Receptacle densely setose. Pappus of numerous short and rigid or chaffy bristles, separately deciduous. Leaves never prickly. — See p. 212.

rigid scabrous fragile bristles, dirty or tawny, rarely white and soft. Perennials, commonly with hispid or hirsute, or often glandular pubescence.

77. **Crepis.** Involucre few to many-flowered, somewhat imbricated, or more commonly a series of equal bracts and some short calyculate ones. Akenes from columnar to fusiform, 10 to 20-costate. Pappus of copious white and usually soft capillary bristles. Annuals or perennials.

= = Flowers from whitish or cream-color to violet or rose-red.

78. **Prenanthes.** Heads 5 to 30-flowered, mostly nodding. Akenes terete or 4 to 5-angled, commonly striate, with truncate summit. Pappus of copious rather rigid capillary bristles, in one section from whitish to ferruginous. Leafy-stemmed perennials, with paniculate or thyrsoidly disposed heads ; leaves dilated.

79. **Lygodesmia.** Heads 3 to 12-flowered, erect. Akenes terete, obscurely few-striate or angled, commonly linear or slender-fusiform. Pappus of copious and usually unequal capillary bristles, either soft or rigidulous, from sordid-whitish to white. Stems mostly rush-like and striate; leaves narrow-linear or reduced to scales. Flowers rose-colored.

++ ++ Beak to the akenes distinct and slender : heads erect.

80. **Troximon.** Heads many-flowered, solitary, terminating simple naked scapes. Involucre campanulate or oblong, more or less imbricated. Akenes 10-costate or 10-nerved, smooth, not muricate nor sculptured. Pappus white or whitish. Flowers yellow, orange, or rarely purple.

81. **Taraxacum.** Heads many-flowered, solitary, terminating simple and fistulous naked scapes. Involucre campanulate or oblong, a single series of nearly equal narrow bracts, a little connate at base, and several or numerous calyculate bracts at the base. Akenes oblong-obovate to fusiform, 4 to 5-costate or angled, muricate or spinulose, the summit abruptly contracted into a filiform beak. Pappus soft and capillary, dull white, no woolly ring at its base. Flowers yellow.

82. **Pyrrhopappus.** Heads and involucre nearly of the last, terminating scapose or leafy stems or branches. Akenes oblong or linear-fusiform, about 5-costate or sulcate, muriculate-rugulose, tapering abruptly into a long filiform beak. Pappus copious, soft and capillary, fulvous or rufous, its base usually surrounded by a soft-villous ring. Flowers yellow.

+ + + Akenes flattened : pappus of copious fine and soft capillary bristles : leafy-stemmed plants, with more or less paniculate heads.

83. **Lactuca.**[1] Involucre cylindraceous, or in fruit somewhat conoidal, several to many-flowered. Akenes obcompressed, and with a beak or narrowed summit, which is more or less expanded at apex into a pappiferous disk. Pappus of bright white or rarely sordid bristles, falling separately.

1. VERNONIA, Schreb. Iron-weed.

Perennial herbs, with alternate pinnately-veined leaves, and usually purple or rose-colored flowers, sometimes varying to white.

1. **V. fasciculata,** Michx. Glabrous, or nearly so, 2 *to* 5 *feet high:* leaves thickish, *from linear to oblong-lanceolate, conspicuously spinulose-denticulate:* heads numerous and *crowded on the branches of the compound cyme:* involucre (3 or 4 lines high) 20 to 30-flowered; its bracts all obtuse, or some of the uppermost abruptly mucronate-acute. — From Dakota to Texas within the eastern limits of our range, and eastward to the Mississippi States.

[1] The following Old-World genus has several species naturalized within our range : —

Sonchus. Involucre campanulate or broader, in age usually broadened and fleshy-thickened at base, and becoming conical. Akenes obcompressed, destitute of beak or neck or dilated pappiferous disk. Pappus of very soft and fine flaccid bristles, which fall more or less in connection, and commonly one or more stronger ones, which fall separately.

2. **V. Jamesii,** Torr. & Gray. Glabrous or nearly so, *a foot or two high: leaves linear-lanceolate or linear,* like those of narrowest forms of the last, but *smaller and less* or obsoletely *denticulate:* heads few or numerous *in a loose and open corymbiform cyme,* all pedunculate: involucre (4 or 5 lines high) 15 to 25-flowered; its bracts all or mostly obtuse. — Fl. ii. 94. Plains of Nebraska and Arkansas to W. Texas and E. New Mexico.

2. EUPATORIUM, Tourn. Thoroughwort.

Herbs or shrubby, commonly with opposite leaves, mostly resinous-atomiferous and bitter; the small heads corymbosely cymose or paniculate.

* *Involucre imbricated, the outer bracts successively shorter: herbs.*

+ *Heads* 5 *to* 10*-flowered: leaves verticillate.*

1. **E. purpureum,** L. From pubescent to nearly glabrous: stem simple, 3 to 9 feet high: leaves commonly 3 to 6 in a whorl, from oval-ovate to oblong-lanceolate, acuminate, coarsely serrate, reticulate-veiny, the base narrowed into a short petiole: cymes polycephalous, compound-corymbose and numerous: involucre whitish and flesh-colored: flowers dull flesh-color or purple, rarely almost white. — From the Sierra Nevada, eastward across the continent. Known as "Joe-Pye Weed" and "Trumpet Weed." Varies exceedingly; the commonest form being

Var. **maculatum,** Darl. Stem 3 to 4 feet high, often roughish-pubescent, commonly purple, striate or sulcate: leaves somewhat rugose: inflorescence more compact.

+ + *Heads* 10 *to* 20*-flowered: leaves opposite.*

2. **E. Bruneri,** Gray. *Minutely puberulent,* a foot or two high: *leaves acutely serrate, ovate-oblong,* 2 *or* 3 *inches long, very short-petioled: paniculate* rather slender *peduncles bearing* 3 *or more sessile or short-peduncled heads:* involucre campanulate, *at least* 20*-flowered,* of comparatively few obscurely striate obtuse bracts; the outer oval, puberulent; inner ones scarious and glabrous, flesh-color: akenes glabrous. — Synopt. Fl. i. 96. Damp ground, in the Rocky Mountains at Fort Collins, N. Colorado, *Dr. Bruner.*

3. **E. perfoliatum,** L. Stem 2 to 4 feet high, *villous-pubescent,* fastigiately branched above, stout: *leaves lanceolate, connate-perfoliate,* tapering gradually to an acuminate apex, *finely and closely crenate-serrate,* rugose, soft-pubescent, or almost tomentose beneath, 4 *to* 8 *inches long:* heads small but very numerous, in dense compound-corymbose cymes, *mostly* 10*-flowered:* bracts of the involucre linear-lanceolate, with slightly scarious acutish tips. — From Dakota, within the N. E. limit of our range, to Louisiana and eastward across the continent. Known as "Thoroughwort" and "Boneset."

* * *Involucre of bracts all of the same length or nearly so, in one or two series: leaves opposite and petioled: shrubs.*

4. **E. ageratifolium,** DC. Shrub 3 to 7 feet high, with slender and spreading mostly herbaceous branches, green and nearly glabrous: leaves deltoid-ovate, coarsely and rather obtusely dentate, 2 or 3 inches long, slender-petioled: heads pedicelled, numerous in corymbiform cymes, 10 to 30-flowered: involucral bracts 8 to 12, narrowly lanceolate or linear. — *E. Berlandieri,* DC. From S. Colorado to Texas.

3. KUHNIA, L.

Perennials, with mostly alternate leaves, more or less sprinkled with resinous atoms, usually with scattered or cymose-clustered heads of 10 to 30 whitish or at length purple flowers; pappus mostly tawny.

1. **K. eupatorioides,** L. Stem herbaceous, 2 or 3 feet high: leaves from oblong-lanceolate to linear, irregularly few-toothed or upper ones entire, the lower narrowed at base and sometimes short-petioled: pubescence minute or soft and cinereous, or hardly any: heads more or less cymose-clustered. — From Montana to Texas and eastward to Pennsylvania and New Jersey. Very variable.

Var. **corymbulosa,** Torr. & Gray. A foot or two high, stouter, somewhat cinereous-pubescent or tomentulose: leaves rather rigid and sessile, from oblong to lanceolate, coarsely veiny: heads rather crowded. — From Dakota and Nebraska to Texas and eastward to the Mississippi States.

4. BRICKELLIA, Ell.

Herbs or undershrubs, with opposite or alternate veiny leaves and heads of white, ochroleucous, or even flesh-colored flowers.

* *Heads 30 to 40-flowered, ½ to ⅔ inch long: leaves slender-petioled, at least the lower ones opposite: perennial herbs.*

1. **B. grandiflora,** Nutt. Puberulent or almost glabrous: stem 2 or 3 feet high, paniculately branched: the numerous heads paniculate-cymose and drooping: leaves broadly or narrowly deltoid-cordate, coarsely dentate-serrate and with an entire gradually acuminate apex, the larger 4 inches long: bracts papery and scarious-margined when dried: pappus white, inclined to be deciduous. — In the mountains from New Mexico and Arizona to Montana and Oregon.

Var. **minor,** Gray, is a smaller form, with leaves only an inch or two long, heads proportionally small, involucre fewer-flowered. — Clear Creek, Colorado, to California in the Sierra Nevada, and Arizona.

* * *Heads 9 to 25-flowered, not over ½ inch long: leaves distinctly petioled, mostly alternate: stems shrubby at base.*

2. **B. Wrightii,** Gray. Usually much branched from a woody base, 2 to 4 feet high, *puberulent: leaves broadly deltoid-ovate or rounded-cordate* and obtuse, more or less crenate-dentate, *½ to 1½ inches long: heads glomerate-paniculate,* the clusters shorter than or little surpassing the subtending leaves: involucre often purple. — Pl. Wright, ii. 72. From Colorado and Arizona to W. Texas.

3. **B. microphylla,** Gray. *Glandular-puberulent or pubescent and viscid,* a foot or two high from a partly woody base, paniculately much branched; *the short leafy branchlets terminated by 1 to 3 heads: leaves subcordate or ovate to oblong,* when old somewhat scabrous, sparingly denticulate or nearly entire, *the larger ½ inch long, those of flowering branchlets a line or two long:* heads nearly ¼ inch long, about 15-flowered. — Pl. Wright. i. 85. From S. W. Colorado to California and Oregon.

5. LIATRIS, Schreb. Blazing Star.

Herbs, with simple virgate very leafy stems from a tuberous or mostly globose and corm-like stock, bearing spicate heads of rose-purple flowers; the leaves all alternate, narrow, entire, rigid, mostly glabrous.

* *Pappus very plumose: heads* 16 *to* 60*-flowered.*

1. **L. squarrosa,** Willd. Pubescent or partly glabrous: stem stout, 6 to 20 inches high: leaves all linear and rigid; the lower grass-like: heads few, or sometimes numerous in a leafy spike or raceme, the larger an inch or more long: bracts of the involucre much imbricated, all herbaceous and acuminate, or with foliaceous or herbaceous lanceolate rigid and somewhat pungent tips; these usually squarrose-spreading and prolonged. — Within the eastern limit of our range and extending eastward across the continent.

Var. **intermedia,** DC. Heads narrow: bracts of the involucre erect or little spreading, less prolonged. — Same range as the type, perhaps extending a little farther west.

* * *Pappus plainly plumose to the naked eye: heads* 4 *to* 6*-flowered.*

2. **L. punctata,** Hook. Stems a span to 30 inches high from a thick and branching or sometimes globular stock, stout: leaves all narrowly linear, as well as bracts commonly punctate, rigid: head oblong or cylindraceous, thickish, from ½ to ¾ inch long, mostly numerous and crowded in a dense spike: bracts of the involucre oblong, abruptly or sometimes more gradually cuspidate-acuminate, often lanuginous-ciliate. — On the plains from the Saskatchewan to Montana and southward to Texas and New Mexico.

* * * *Pappus minutely barbellate, not plumose: heads* 25 *to* 40*-flowered.*

3. **L. scariosa,** Willd. Pubescent or glabrate: stem stout, 1 to 5 feet high: leaves spatulate- or oblong-lanceolate and tapering into a petiole, 4 to 6 inches long; upper narrowly lanceolate; uppermost small, linear, sessile: heads racemose or spicate, few or numerous (3 to 50), about an inch high and wide or much smaller: involucral bracts broadest and rounded at summit, there either herbaceous or scarious edged and tinged with purple (rarely white-scarious). — From the Rocky Mountains eastward across the continent. Extremely variable.

6. GUTIERREZIA, Lag.

Ours is a suffruticose plant, with narrow entire and alternate leaves, small heads of yellow flowers, and pappus of ray and disk similar, consisting of chaffy scales which vary from narrowly oblong to linear-subulate.

1. **G. Euthamiæ,** Torr. & Gray. Bushy, from glabrous to puberulent, 6 to 18 inches high, with mostly strict and fastigiately polycephalous branches: leaves narrowly linear, verging to filiform: heads mostly clavate-oblong, few to several-flowered, not over 2 lines long, some short-pedunculate, others 3 to 5 in a glomerule: flowers of disk and ray not numerous: akenes sericeous-pubescent. — From the Saskatchewan and Montana to New Mexico and California.

7. GRINDELIA, Willd. Gum-Plant.

Herbs of coarse habit; with sessile or partly clasping and usually serrate rigid leaves, and rather large heads of yellow flowers terminating the branches; the narrow rays numerous, occasionally wanting. Heads more or less viscid, especially before blooming, but the herbage glabrous (in ours).

* *Akenes squarely truncate and even at the summit, not toothed: pappus-awns 2 or 3.*

1. **G. squarrosa,** Dunal. Commonly only a foot or two high and branched from the base: leaves rigid; cauline from spatulate- to linear-oblong and with half-clasping base, acutely and often spinulosely serrate or denticulate; sometimes radical and even cauline laciniate-pinnatifid: involucre strongly squarrose with the spreading and recurving short-filiform tips of the bracts: outer akenes commonly corky-thickened and with broad truncate summit, those toward the centre narrower and thinner-walled. — On the plains, from the Saskatchewan to Texas and westward to the Sierra Nevada.

Var. **nuda,** Gray. Rays wanting. — With the radiate form in Colorado and New Mexico.

* * *Akenes narrow, excisely truncate or bidentate at summit: pappus awns mostly 2.*

2. **G. nana,** Nutt. Rather low and slender, 6 to 30 inches high, the larger plants corymbosely and freely branched above: leaves thinnish, lanceolate and linear, or the lower spatulate, entire or spinulose serrate: heads small: bracts of the involucre with slender and squarrose soon revolute tips, as in the last: rays 16 to 30. — From N. W. Wyoming to Oregon and Washington Territory; replacing *G. squarrosa* in the Northwest.

8. CHRYSOPSIS, Nutt. Golden Aster.

Herbs, with pubescence from hispid to silky, leaves entire or few-toothed, yellow flowers in middle-sized heads terminating the stem and branches. Our single species includes a multitude of forms, the more marked of which are given as varieties.

1. **C. villosa,** Nutt. A foot or two high: leaves from oblong to lanceolate, rarely few-toothed, usually cinereous or canescently strigose or hirsute and sparsely hispid along the margins and midrib, an inch or two long: heads mostly terminating leafy branches, sometimes rather clustered, naked at base or leafy-bracteate: involucre campanulate, 4 or 5 lines high; its bracts commonly strigulose-canescent, sometimes almost smooth, acute: akenes oblong-obovate, villous: outer pappus of chaffy bristles. — On open ground from the Saskatchewan to Alabama and westward across the continent.

Var. **hispida,** Gray. Small and low, with hirsute and hispid pubescence, not canescent: heads particularly small: involucre not canescent, sometimes glabrous. — Proc. Acad. Philad. 1863, 65. Saskatchewan to W. Texas and Arizona.

Var. **discoidea,** Gray. Heads destitute of rays: involucre somewhat canescent: otherwise nearly as the last. — Synopt. Fl. i. 123. Cañons, W. Montana, *Watson.*

Var. **foliosa,** Eaton. Canescent with appressed sericeous pubescence, mostly soft and destitute of hispid bristles; but stem often hirsute or villous: leaves short, oblong or elliptical: heads small, rather numerous and clustered. — Bot. King Exp. 164. Mountains of Wyoming to Utah and Arizona.

Var **Rutteri,** Rothrock. Most like the preceding, equally sericeous-canescent with usually longer soft hairs: heads of double the size, fully ½ inch high and wide, solitary or few in a cluster, foliose-bracteate: rays 30 to 40, ½ inch long. — Wheeler Rep. vi. 142. S. Arizona; also Colorado, where the leaves are slightly canescent.

9. APLOPAPPUS, Cass.

A large and polymorphous genus; mostly herbaceous, some suffruticose: the flowers all yellow, and occasionally rayless, thus making them undistinguishable from the following genus.

* *Involucre of firm well-imbricated or rigid bracts: rays numerous, several, or wanting: pappus commonly fuscous or rufous, and more or less rigid.*

+– *Heads rayless: akenes sericeous-canescent: leaves coriaceous, dentate.*

1. **A. Nuttállii,** Torr. & Gray. Herbaceous from a woody stock, a span to a foot high: leaves from spatulate-oblong to almost lanceolate: heads few terminating the branches, one third inch high: involucre hemispherical; the bracts with slightly spreading greenish tips. — From New Mexico and Arizona to Idaho and the Saskatchewan.

+– +– *Heads conspicuously radiate, large and showy: rays very numerous, ½ to 1 inch long: akenes wholly glabrous: leaves coriaceous, entire.*

++ *Stems equably and very leafy up to the sessile or subsessile heads.*

2. **A. Fremonti,** Gray. A foot or less high, simple or fastigiately branched above: leaves lanceolate, 2 to 4 inches long, obscurely 3 to 5-nerved; lower narrowed and upper partly clasping at base: involucre (inch or less high) broadly campanulate; its bracts broadly lanceolate, conspicuously and often cuspidately acuminate: rays ½ inch long: akenes obovate, striate-nerved, almost as long as the rigid pappus. — Proc. Acad. Philad. 1863, 65. Colorado.

Var. **Wardi,** Gray. Dwarf: fascicled stems only a span high: leaves proportionally small, linear-lanceolate, destitute of lateral nerves: heads one-half smaller, 2 or 3 in a terminal glomerule: akenes double the length of the scanty pappus. — Synopt. Fl. i. 128. Wyoming, *L. F. Ward.*

++ ++ *Stems simple, above with decreasing or sparse leaves and solitary or few naked and usually pedunculate heads, at base a tuft of ample lanceolate- or spatulate-oblong radical leaves.*

3. **A. croceus,** Gray. Stem stout and erect, commonly a foot or two high, and with *radical leaves a foot or less long* (including the petiole): cauline leaves ovate-oblong to lanceolate, partly clasping: *head mostly solitary: involucre a full inch in diameter;* its *bracts ovate to spatulate-oblong,* very obtuse, lax, inner with scarious erose-denticulate margins: *rays saffron-yellow, sometimes inch long:* akenes narrowly oblong, nearly the length of the pappus. — Proc. Acad. Philad. 1863, 65. Mountains of Colorado.

4. **A. integrifolius,** T. C. Porter. Stems several from the caudex, ascending, a foot or less high: *radical leaves 3 to 8 inches* (including short

petiole or tapering base); cauline lanceolate, or small uppermost linear: *heads solitary or* 2 *or* 3 *in axils, smaller* than in foregoing: involucral *bracts narrowly oblong to linear-lanceolate*, some loose outer ones usually equalling the disk and more foliaceous: *rays bright yellow, half-inch long:* immature akenes oblong. — Gray, Proc. Am. Acad. xvi. 79. Mountain meadows, Wyoming, and Montana.

+ + + *Heads conspicuously radiate, smaller: rays* ½ *to barely* ¾ *inch long: akenes silky pubescent or villous.*

++ *Mostly simple stems with a tuft of radical leaves: leaves coriaceous, entire or spinulose-serrate, the cauline diminished upwards: rays* 20 *to* 50: *pappus pale, rather soft and fine.*

5. **A. uniflorus,** Torr. & Gray. Stems a span to barely a foot high, ascending or erect, *sometimes* 5 *to* 6-*leaved, sometimes rather scapiform or upper leaves reduced and bract-like, bearing a solitary head,* rarely one or two from lower axils: leaves lanceolate or sometimes broader; radical 2 or 3 inches long and usually petioled: involucre commonly ¼ inch high and the *linear or oblong-linear bracts all of same length, rather loose,* outer all foliaceous. — *A. uniflorus* & *A. inuloides,* Torr. & Gray, Fl. ii. 241. From the Saskatchewan to Montana, Utah, and Colorado.

6. **A. lanceolatus,** Torr. & Gray. Habit of the preceding: *stems generally more leafy and bearing* 3 *to* 15 *heads;* these when few subcorymbose, when more numerous racemosely or paniculately disposed: involucre in the type fully ½ inch high; *its bracts rather closely imbricated in* 3 *or* 4 *unequal series, lanceolate,* acutish, with short green tips and whitish coriaceous base; outer successively shorter, occasionally some of them longer and more herbaceous. — Eaton, Bot. King Exp. 160. From the Saskatchewan to British Columbia and N. Nevada.

Var. **Vaseyi,** Parry. Heads a third or quite half smaller, disposed to be racemose and involucre closer. — Saskatchewan to Wyoming, Utah, and Colorado.

++ ++ *Very dwarf from a multicipital caudex, leafy up to the small heads: leaves all narrow and entire: rays* 7 *to* 10: *pappus scanty, somewhat fulvous.*

7. **A. multicaulis,** Gray. Very dwarf, tufted, tomentulose, but early glabrate and smooth: stems 1 to 3 inches high from a ligneous caudex, simple or forked, bearing 3 or 4 leaves and few heads: leaves narrowly linear, or the lowest obscurely spatulate, an inch long: bracts of the involucre large and rather few (9 to 14), from ovate to oblong-lanceolate, cuspidate-acuminate, marked with a green spot below the slender cusp, or the outermost with a larger foliaceous tip. — Am. Nat. viii. 213. On rocks, mountains of N. W. Wyoming.

++ ++ ++ *Branching and leafy: leaves not rigid, dentate or pinnatifid, the teeth and tips bristle-tipped: rays conspicuous,* 15 *to* 30: *pappus rather rigid, its bristles very unequal in size and strength.*

8. **A. rubiginosus,** Torr. & Gray. One to three feet high, *viscid-glandular and pubescent: leaves lanceolate or narrowly oblong, incisely pinnatifid or dentate with salient narrow teeth:* heads somewhat cymosely paniculate, 5 or 6 lines high, usually naked pedunculate: bracts of the involucre linear-subulate,

with slender spreading green tips: rays deep golden-yellow. — Fl. ii. 240. From S. Texas to the plains of Colorado as far as the mountains.

9. **A. spinulosus,** DC. *Canescently puberulent or glabrate:* stems a span to a foot high, cymosely branching at summit: *leaves pinnately and the lower often bipinnately parted* into rather numerous lobes; *lobes and teeth, as well as appressed involucral bracts setaceous-tipped.* — Plains, from the Saskatchewan to Texas and westward to Dakota, Colorado, and Arizona.

* * *Bracts of the involucre from ovate to lanceolate or even linear, not rigid, all of equal or about equal length: rays several or numerous: pappus soft and white or whitish: leaves all entire.*

+– *Heads cymose or glomerate at the summit of a leafy stem: involucre campanulate: rays* 12 *to* 20, *small and narrow: akenes short and glabrous or nearly so.*

10. **A. Parryi,** Gray. Green and almost glabrous, puberulent, and somewhat viscid above: stems 6 to 18 inches high: leaves oblong-obovate and spatulate, or the upper oblong-lanceolate, thinnish, 2 to 4 inches long: heads nearly ½ inch high, rather numerous: involucral bracts oblong, obtuse, pale, and in about three moderately unequal ranks: flowers pale yellow. — Am. Jour. Sci. II. xxxiii. 10. Mountains of Colorado to the Wahsatch.

+– +– *Dwarf: heads solitary, terminating simple stems or branches: rays conspicuous.*

–+– *Wholly herbaceous, chiefly alpine, disposed to be cespitose, a span or less in height: leaves soft, not persistent: involucre hemispherical: rays* 15 *to* 20.

= *Green, not woolly, mostly equably leafy up to the head.*

11. **A. pygmæus,** Gray. Less than a span high, *soft-pubescent or glabrate, not viscid* nor glandular: leaves from linear-spatulate to spatulate-oblong: *involucral bracts oblong,* outer ones foliaceous and loose, *very obtuse,* equalling the thinner innermost: *akenes pubescent.* — Am. Jour. Sci. II. xxxiii. 239. Alpine region of Colorado mountains.

12. **A. Lyalli,** Gray. Rather taller, larger-leaved, *viscid-puberulent:* leaves obovate-spatulate to oblanceolate: *involucre glandular;* its *bracts lanceolate, acute,* sometimes 2 or 3 outermost oblong and more foliaceous: *akenes and ovaries glabrous* or nearly so. — Proc. Acad. Philad. 1863, 64. Alpine region of Colorado mountains; also in Montana, Oregon, and northward.

= = *Woolly or tomentose, at least the involucre, above less leafy, or head pedunculate.*

13. **A. lanuginosus,** Gray. Fully a span high from creeping rootstocks, floccose-tomentose: leaves soft, narrowly spatulate or upper linear, an inch or two long; the sparse uppermost almost filiform: bracts lanceolate, acute or acuminate, thin, nearly equal, in two series, outer barely greenish: akenes sericeous-canescent. — Wilkes Ex. Exped. xvii. 347. From Montana, *Watson,* to the mountains of Washington Territory.

–+– –+– *Depressed-cespitose from a multicipital woody caudex, glabrous or puberulent: leaves rigid and persistent, crowded on the crowns of the caudex or on short shoots, a few on the scapiform flowering stems: rays* 6 *to* 15: *akenes canescently villous.*

14. **A. acaulis,** Gray. Leaves from spatulate to oblanceolate or linear, mucronate, more or less 3-nerved and the broader ones veiny, commonly sca-

brous: scapiform flowering stems an inch to a span high, mostly monocephalous: *bracts of the involucre from ovate to ovate-lanceolate, mucronately acute or acuminate, destitute of greenish tips;* the outer a little shorter than the inner. — Proc. Am. Acad. vii. 353. In the mountains from the Saskatchewan to California and Oregon.

Var. **glabratus,** Eaton. Glabrous and smooth or nearly so: flowering stems disposed to be leafy above and to branch, so bearing 2 or 3 heads. — Bot. King Exp. 161. Wyoming to Nevada and Arizona.

15. **A. armerioides,** Gray. Smooth and glabrous: flowering stems naked above for 1 to 3 inches, sometimes nearly scapiform: *bracts of the campanulate involucre broadly oval, rounded-obtuse or retuse,* muticous, of about three lengths; the outermost much shorter, *most of them greenish at apex.* — Rocks on mountains, from Wyoming to New Mexico and S. Utah.

* * * *Heads mostly solitary, terminating leafy branches: involucre of lanceolate or linear bracts in few ranks and of somewhat equal length; outer with conspicuous leafy tips, or loose and foliaceous, passing into leaves: rays few and conspicuous, or wanting: pappus soft and slender: low and many-stemmed from a suffrutescent base: leaves soft, spatulate-oblong to broadly linear, sessile, entire.*

16. **A. suffruticosus,** Gray. *Destitute of tomentum:* stems glandular-pubescent or puberulent: *heads* ⅜ *to* ¾ *inch high: rays* 2 *to* 5 and somewhat exserted, or none: disk-flowers 10 to 30. — Proc. Am. Acad. vi. 542. Alpine or subalpine, from California to Oregon and N. Wyoming.

17. **A. Macronema,** Gray. Stems stouter, *whitened by a dense and close tomentum:* head commonly larger, *one inch long: rays always wanting.* — Loc. cit. Mountains of Colorado, Wyoming, and westward.

10. BIGELOVIA, DC. Rayless Golden-rod.

Mostly suffrutescent or more shrubby plants, generally few-flowered, but grading easily into both *Solidago* and *Aplopappus.* Includes *Linosyris.*

* *Heads comparatively large, at least* ½ *inch long, but narrow,* 5 *to* 20*-flowered: bracts of the involucre chartaceous and acuminate, some of the outer prolonged into a slender herbaceous tip; when numerous the vertical ranks are more or less apparent: low and suffrutescent, with linear entire leaves, not punctate nor viscid.*

+– *Style-appendages conspicuously exserted: akenes pubescent: stems and branches whitened (at least when young) by a close tomentum.*

1. **B. Parryi,** Gray. Stems rather strict, leafy to the summit: leaves linear, 2 *or* 3 *inches long,* 2 lines or less wide, *obscurely* 3*-nerved,* glabrous; upper ones hardly diminished in size and overtopping all the heads of the *strict and narrow thyrsiform-virgate panicle: heads* 10 *to* 15*-flowered:* bracts of the involucre about 12. — Parks of the Colorado mountains.

2. **B. Howardi,** Gray. Low, rather tufted, canescently tomentulose when young: leaves narrowly linear, rigid, *an inch or two long,* barely a line wide, *obscurely* 1*-nerved;* upper mostly overtopping the *glomerate narrow heads: involucre* 5*-flowered;* its bracts 15 to 18. — Proc. Am. Acad. viii. 641. Parks of the Colorado mountains to New Mexico and Utah.

+– +– *Style-appendages hardly exserted: akenes glabrous: involucre* 15 *to* 20-*flowered: herbage glabrous throughout.*

3. **B. Engelmanni,** Gray. A span or two high, in tufts from a subterranean branching caudex: stems simple, very leafy up to the cymose-glomerate heads: leaves all narrowly linear, an inch or two long, only a line wide, rigid: bracts of the involucre regularly imbricated and appressed, outer similar but short, all abruptly mucronate or short-cuspidate, slightly greenish below the tip. — Proc. Am. Acad. xi. 75. Plains of Colorado at Hugo Station.

* * *Heads narrow or small,* 5-*flowered, mostly numerous and crowded: involucre of dry chartaceous more or less keeled bracts imbricated so as to form* 5 *conspicuous vertical ranks: shrubby and branching, with narrow entire leaves.*

+– *Akenes and ovaries glabrous,* 4 *to* 6-*angled: pappus rigidulous: bracts of the involucre acute or acuminate, numerous and strictly* 5-*ranked,* 5 *or* 6 *in each vertical rank: herbage not punctate, slightly or not at all resinous.*

4. **B. depressa,** Gray. *Obscurely puberulent and pale, a span or two high* from a decumbent woody base: branches leafy up to the glomerule or fasciculate cyme of few heads: *leaves short,* about ½ inch or less long, *lanceolate or lowest rather spatulate,* rigid, *mucronate-acute,* with carinate midrib and no veins: heads ½ inch long: involucral bracts lanceolate, *gradually acuminate into an almost setaceous tip.* — Plains of S. Colorado to New Mexico and S. Utah.

5. **B. pulchella,** Gray. *Glabrous and green,* shrubby, 2 *or* 3 *feet high,* fastigiately much branched, very leafy up to fastigiate-cymose heads: *leaves narrowly linear,* plane, an inch or less long, *rather obtuse,* with ciliolate-scabrous margins and *midrib not prominent:* heads ⅝ to ¾ inch long: involucral bracts *rigid-chartaceous,* much carinate, *acute and cuspidate-mucronate.* — W. Texas to New Mexico and Colorado.

6. **B. Bigelovii,** Gray. *Canescent with fine close tomentum* when young, glabrate, shrubby, *a foot to a yard high,* fastigiately much branched, rigid: branches less leafy, bearing a few fastigiate-clustered heads, ½ to ⅝ inch high: *leaves nearly filiform:* involucral bracts lanceolate, *acute, thinnish,* all pale. — N. New Mexico and adjacent Colorado.

+– +– *Akenes canescently pubescent or villous: herbage commonly graveolent and mostly becoming more or less resinous or viscid.*

+– *Leaves numerous, filiform: involucral bracts* 3 *in each vertical rank, mostly with small subulate spreading or recurving tips.*

7. **B. Greenei,** Gray. Suffruticose, about a foot high, green and glabrous, more or less balsamic-viscid: leaves very numerous on the branches, filiform-acerose, but flat, and margins minutely scabrous: heads numerous and fastigiate-cymose, 3 or 4 lines high. — Proc. Am. Acad. xi. 75. Colorado, on the Huerfano Plains and near Twin Lakes; also in Utah.

+– +– *Leaves numerous, from filiform-linear to broadly linear or lanceolate: bracts of the involucre obtuse or somewhat acute.*

8. **B. graveolens,** Gray. A foot to a yard or more high, bearing numerous crowded heads: these ½ or ⅝ inch high: *leaves mostly flocculent-tomentose when young,* often glabrate in age, not rigid; the larger spatulate-linear, or

linear-lanceolate, 2 inches long and 2 lines wide, *obscurely if at all 3-nerved;* the narrowest almost filiform, at least when dry, and *margins involute:* involucre *thin-chartaceous* when dry: corolla-lobes or teeth short, from lanceolate to nearly ovate: akenes linear: *pappus soft.* — Proc. Am. Acad. viii. 644. From New Mexico and S. California to Dakota and British Columbia. An exceedingly polymorphous species, the following varieties representing the principal forms within our range.

Var. **glabrata,** Gray. Includes forms with the usually narrow leaves early glabrate or perhaps glabrous from the first, sometimes balsamic, sometimes not. — Not rare in Colorado, where even the branches sometimes early lose their light tomentum.

Var. **albicaulis,** Gray. Branches for the most part permanently and very densely white-tomentose and leaves floccose-tomentose: involucre either tomentulose or glabrate; its bracts commonly acutish: corolla-lobes more or less lanceolate and the tube villous-pubescent. — Mountains of Wyoming to British Columbia; also in California.

Var. **latisquamea,** Gray. Rather stout, white-tomentose or partly glabrate: heads numerous in the corymbiform cymes: bracts of the glabrous involucre mostly elliptical-oblong, very obtuse: lobes or teeth of the corolla short, somewhat lanceolate, the tube glabrous. — S. E. Colorado to New Mexico and S. Utah.

9. **B. Douglasii,** Gray. *Green, no tomentum:* from 6 inches to 6 feet high, *fastigiately branched, sometimes resinous-viscid,* often slightly or not at all so: leaves from very narrowly linear or almost filiform (*but plane*) to lanceolate-oblong, *mostly 3-nerved:* heads few or numerous and fastigiate-cymose: bracts of the involucre comparatively few, only 2 to 4 in each vertical rank, from broadly to linear-oblong or lanceolate, obtuse, *firm-chartaceous: pappus rigidulous.* — From Dakota to Washington Territory and southward into California and New Mexico. Very variable, with the following principal forms.

Var. **pumila,** Gray. A dwarf northern and mountain state, a span or two high, glabrous or minutely puberulent and disposed to be viscidulous; the simple branches bearing very few heads in a close cluster: outer involucral bracts either somewhat greenish-tipped or passing into bract-like leaves. — N. Montana to Washington Territory and mountains of Utah.

Var. **serrulata,** Gray. Taller: leaves linear or narrowly lanceolate, serrulate-ciliolate, sometimes scabrous and rigid. — Common through the whole dry interior region.

Var. **tortifolia,** Gray. Leaves twisted: otherwise like the preceding. — Plains of Colorado to California.

Var. **lanceolata,** Gray. Low, but bearing compact cymes of numerous (5 to 7-flowered) heads: leaves short, lanceolate or broadly linear, puberulent. — Synopt. Fl. i. 140.

+– +– +– *Akenes and ovaries glabrous, nearly terete: bracts of the involucre rounded-obtuse: suffrutescent, green and glabrous.*

10. **B. Vaseyi,** Gray. A span or two high, somewhat balsamic-viscid, leafy up to the fastigiate-cymose cluster of heads: leaves linear or spatulate-linear, obtuse, plane: involucre 3 or 4 lines long; its bracts narrowly oblong,

firm-chartaceous, and all but innermost with a thickened greenish spot at the very obtuse apex: pappus fine and soft, rather short. — Proc. Am. Acad. xii. 58. Colorado mountains, in Middle Park and Gunnison Valley; also in Utah.

* * * *Heads several to many-flowered: bracts of the involucre coriaceous, and usually somewhat herbaceous or thickened at the obtuse apex, all strictly appressed and imbricated, but the vertical ranks inconspicuous: akenes pubescent: leaves linear, entire or sparingly dentate: herbaceous down to the suffrutescent base.*

11. **B. pluriflora,** Gray. Leaves narrowly linear, entire: *heads* 15 *to* 18-*flowered,* 4 lines high: involucre somewhat turbinate, very smooth; *its thinnish bracts lanceolate, acute:* otherwise like the next, of which it is probably a form. — Colorado? probably on the Arkansas or South Fork of the Platte, *James* in Long's expedition.

12. **B. Wrightii,** Gray. Commonly glabrous or nearly so: stems rather strict and slender, a foot or two high: leaves thickish, narrowly linear, entire, sometimes *lower ones sparingly laciniate-dentate,* margins either smooth or sparingly scabrous: heads (4 or 5 lines high) 7 *to* 15-*flowered,* usually numerous and crowded in a corymbiform cyme: bracts of the involucre *oval-oblong to broadly lanceolate, obtuse;* the back at or near the apex usually greenish. — W. Texas to S. Colorado and Arizona.

Var. **hirtella,** Gray. Leaves cinereous-hirtellous or hirsute-pubescent and roughish, but often glabrate in age or only ciliolate: stems sometimes pubescent. — Synopt. Fl. i. 142. Same range.

11. SOLIDAGO, L. Golden-rod.

Herbs, with mostly strict stems, entire or serrate alternate leaves, the cauline sessile or nearly so, the radical tapering into margined petioles: the small heads thyrsoid-glomerate, or sometimes cymose, or more commonly in raceme-like secund clusters: flowers yellow.

§ 1. *Receptacle honeycombed: rays generally fewer or not more numerous than disk-flowers.* — Virgaurea.

* *Heads mostly large,* 4 *to* 6 *lines long, many-flowered, collected in thyrsoidal inflorescence which is not at all secund nor raceme-like: rays* 6 *to* 14: *akenes pubescent: leaves veiny from a simple midrib, mostly bright green: stems low. Ours are mountain or high-latitude forms.*

1. **S. multiradiata,** Ait. *Villous-pubescent above* or glabrate: *leaves minutely and sparingly serrate above,* sometimes entire; cauline spatulate to lanceolate, all tapering gradually to the base, or the radical into a slender margined petiole: heads generally few and *glomerate in a single terminal roundish or oblong compact cluster,* occasionally with one or two looser axillary clusters or branches: *bracts of the involucre narrowly lanceolate, acute*: rays numerous and narrow. — *S. Virgaurea,* var. *multiradiata,* Torr. & Gray. Across the continent in high latitudes and extending southward along the Rocky Mountains to Colorado and New Mexico, where the usual form is

Var. **scopulorum,** Gray. More glabrous, 3 to 18 inches high, commonly strict: heads when numerous in a more open or compound cluster, mostly

smaller · bracts of the involucre closer, shorter, and merely acute. — Proc. Am. Acad. xvii. 187.

2. **S. humilis,** Pursh. *Glabrous, disposed to be glutinous,* bright green: stems strict, leafy: upper leaves lanceolate to nearly linear, *entire;* lower and radical becoming spatulate with long attenuate base, sparingly appressed-serrate above the middle: heads rather crowded in a *narrow racemiform paniculate simple or sparingly branched thyrsus: bracts of the involucre oblong-linear, obtuse.* — *S. Virgaurea,* var. *humilis,* Gray, Man. In the mountains of New Mexico and Colorado, and extending northward to the British possessions, where it ranges eastward across the continent.

Var. **nana,** Gray. A high alpine form, 2 to 5 inches high, with spatulate to obovate leaves, and few heads in a close glomerule, or more numerous in a spike-like thyrsus. — Synopt. Fl. i. 148. *S. Virgaurea,* var. *humilis,* Gray, Proc. Am. Acad. viii. 389. *S. Virgaurea,* var. *alpina,* of Fl. Colorado and Wheeler's Report. High mountains of Colorado and in the Cascades.

* * *Heads smaller,* 2 *or* 3 (*rarely* 4) *lines long, not in a terminal cyme, but in paniculate or raceme-like clusters, which when well developed are collected in a terminal compound panicle or panicles; when the clusters are raceme-like and spreading they are apt to be secund: stems branching only at summit.*

+ *Neither alpine, canescently pubescent, nor the leaves triple-ribbed: leaves entire or little serrate.*

3. **S. spectabilis,** Gray. A foot or two high: *heads numerous and crowded in a narrow or compound and broader thyrsus:* cauline leaves lanceolate, or the small uppermost becoming linear, acute; lower and radical spatulate-lanceolate or oblong, acutish or obtuse, often an inch wide and obscurely triple-ribbed; radical rarely with a few serratures: involucral bracts lanceolate or broader, mostly obtuse: *rays* 8 *to* 15, *small: akenes pubescent.* — Proc. Am. Acad. xvii. 193. *S. Guiradonis,* var. *spectabilis,* Eaton. From the Eastern slopes of the "Front Range" in Colorado to western slopes of the Sierra Nevada

4. **S. speciosa,** Nutt. Commonly 3 to 6 feet high and robust: *leaves thicker and generally ample,* oval or oblong, rather abruptly narrowed into a sessile base, or the larger into a winged petiole, often 4 to 6 inches long and 2 or 3 wide; uppermost small and lanceolate or oblong; primary veins spreading and obscure: thyrsus narrow, composed of *numerous short or rarely elongated spiciform clusters, rigid, rather showy:* heads 3 or 4 lines long: bracts of the well-imbricated involucre of firm texture, narrowly oblong, very obtuse, and with a greenish midnerve: *rays conspicuous,* 5 *or* 6: *akenes glabrous or nearly so.* — Hardly extending into our range, but represented at its eastern border by the

Var. **rigidiuscula,** Torr. & Gray, which is not so tall, has smaller leaves, the lower being spatulate or oblanceolate and only 2 to 4 inches long and hardly an inch wide, the upper more rigid and rougher-edged, and the thyrsus more simple.

+ + *Leaves more or less triple-ribbed, or with a pair of lateral veins continued parallel to the midrib.*

++ *Smooth and glabrous, at least as to the stem and bright green leaves: inflores-*

cence when developed of naked and secund commonly recurving raceme-like clusters collected in a terminal panicle.

5. **S. Missouriensis,** Nutt. *Low or middle-sized: leaves thickish,* with scabrous margins, mostly tapering to both ends, and the *serratures when present sharp and rigid;* lower spatulate-lanceolate, larger 4 to 6 inches long; upper mostly linear and entire, acute; sometimes all entire: racemiform clusters approximated in a short and broad panicle, recurving in age: rays 6 to 13, *small: bracts of the involucre mostly ovate.* — From the eastern slopes of the mountains to the Mississippi Valley States.

Var. **montana,** Gray. Dwarf, 6 to 15 inches high: leaves entire or with few small serratures; cauline obscurely triplinerved, an inch or two long: panicle small and compact, at most 2 or 3 inches long; its clusters short, crowded, seldom recurved or much secund. — Proc. Am. Acad. xvii. 195. From Idaho to Dakota and the Saskatchewan.

Var. **extraria,** Gray. A foot or two high, robust: leaves broader, the largest sometimes an inch wide, sparingly serrate or entire: heads rather larger: rays more conspicuous.— Loc. cit. Dry ground, in the mountains, Colorado to S. Arizona.

6. **S. serotina,** Ait. *Stem stouter and taller,* 2 *to* 7 *feet high,* very smooth up to or near the ample panicle, which is sometimes more or less hairy: *leaves thinner,* lanceolate or broader, *sharply and saliently serrate:* rays 7 to 14, *moderately large and conspicuous:* bracts of the involucre *broadly linear.* — From Oregon to Texas and eastward.

++ ++ *Minutely pubescent or glabrate, not cinereous or scabrous: leaves thinnish, the lateral ribs generally obscure: panicle mostly erect and thyrsiform; heads little if at all secund: rays* 12 *to* 18, *small.*

7. **S. elongata,** Nutt. One to three feet high: leaves lanceolate to oblong, 3 or 4 inches long, very sharply and mostly coarsely serrate: thyrsus rather compact, 3 to 8 inches long, its branches occasionally spreading: bracts of the involucre linear, acutish or obtuse. — From California to British Columbia and eastward to Montana.

++ ++ ++ *Pubescent (at least the stem), either hirsutely or canescently: branches of the panicle when well developed secund.*

= *Leaves tapering gradually to an acute or acuminate point, generally thin or thinnish: panicle open, of naked and secund mostly recurving racemiform clusters: bracts of the involucre narrow and thin: rays small and short.*

8. **S. Canadensis,** L. Stem 2 to 6 feet high, from scabrous-puberulent to hirsute: leaves mostly lanceolate, puberulent, pubescent, or nearly glabrous, sharply serrate or the upper entire, veiny, and with lateral ribs prolonged parallel to the midrib: heads small, ordinarily only 2 lines long: bracts of the involucre small and pale, narrowly linear, acutish or obtuse: rays 9 to 16, more numerous than the disk-flowers. — From Arizona to British Columbia and eastward across the continent.

Var. **procera,** Torr. & Gray. Leaves less serrate or the upper entire, at least the lower face and upper portion of the stem cinereous-pubescent with very short and fine pubescence: inflorescence less open or the branches ascending in less developed or cultivated plants: heads sometimes larger. — From Idaho to Texas and the Saskatchewan.

= = *Leaves obtuse or abruptly apiculate, firm or coriaceous: pubescence all close: panicle mostly naked and compact: bracts of the involucre broadish and obtuse, of firm texture: rays fewer and larger, golden yellow.*

9. **S. nemoralis,** Ait. Mostly low, with fine close soft or (in age) *scabrous* pubescence: leaves from spatulate-obovate to oblanceolate or linear; *radical and lower cauline sparingly serrate: thyrsus and its compact racemiform clusters secund,* commonly recurved-spreading: bracts of the involucre *oblong-linear or narrower,* obtuse: rays 5 to 9. — From Arizona to Nevada and eastward across the continent.

Var. **incana,** Gray. Dwarf, span to a foot high: leaves oval or oblong, rigid, canescent, sometimes strongly serrate and sometimes mostly entire: racemiform clusters erect or the lower spreading, collected in a dense oblong or conical thyrsus. — From the mountains of Colorado and Montana to Dakota and Minnesota.

10. **S. nana,** Nutt. A span to a foot high, canescent with minute dense puberulence, *not scabrous in age:* leaves mostly obovate or spatulate and *entire,* small: heads broad, few or rather numerous *in an oblong or corymbiform panicle, not at all secund:* bracts of the involucre *oval or oblong, very obtuse:* otherwise nearly as *S. nemoralis.* — *S. pumila,* of Fl. Colorado. From Wyoming to N. Arizona and Nevada.

* * * *Heads in a compact and corymbiform thyrsus or cyme: radical leaves mostly long-petioled and with prominent midrib.*

+– *Leaves not 3-nerved or smooth: heads over 30-flowered: rays 7 to 10, rather large.*

11. **S. rigida,** L. Somewhat cinereous with a short and dense, either soft or scabrous pubescence: stem stout, 2 to 5 feet high: leaves rigid, obscurely serrate or entire; radical and lowest cauline oval or oblong, rounded at both ends or acute at base, 3 to 7 inches long; upper cauline ovate-oblong, gradually smaller upward, with slightly clasping or decurrent base: clusters dense: heads campanulate: involucral bracts broad: akenes turgid, 12 to 15-nerved. — From Colorado to the Saskatchewan and eastward.

+– +– *Leaves rigid, 3-nerved, smooth and glabrous: heads 5 to 8-flowered: rays 1 to 3, short.*

12. **S. pumila,** Torr. & Gray. Dwarf, a span or more high, many-stemmed from a woody cespitose caudex, glabrous throughout, punctate, somewhat resinous: radical leaves 2 or 3 inches long: cyme glomerate-fastigiate: heads narrowly oblong: involucral bracts rigid, somewhat carinate, and with small green tips: mature akenes flattish and 5-nerved. — From Texas through S. Colorado to Nevada and Idaho.

§ 2. *Receptacle fimbrillate or pilose: rays very small, almost always more numerous than the disk-flowers and never surpassing them in height: heads glomerately and fasciculately cymose, small: leaves very numerous, all linear, entire, 1 to 5-nerved, sessile: akenes villous-pubescent.*

13. **S. occidentalis,** Nutt. *Stems 2 to 6 feet high;* the branches terminated by small clusters of *mostly pedicellate heads:* leaves usually 3-nerved, *glabrous and smooth even on the midrib,* and margins obscurely scabrous: bracts

of the involucre rather narrow: rays 16 to 20: disk-flowers 8 to 14. — Torr. & Gray, Fl. ii. 226. From New Mexico to Montana and westward.

14. **S. lanceolata,** L. *Comparatively low, cymosely much branched above* and flat-topped, *heads mostly glomerate-sessile:* leaves lanceolate-linear, distinctly 3-nerved and the larger with an additional outer pair of more delicate nerves, *minutely scabrous-pubescent on the nerves beneath:* outer bracts of the involucre ovate or oblong: rays 15 to 20: disk-flowers 8 to 12. — From Montana to Canada and Georgia.

12. TOWNSENDIA, Hook.

Depressed or low many-stemmed herbs of the Rocky Mountains: entire leaves from linear to spatulate: heads comparatively large, the numerous rays from violet or rose-purple to white: akene commonly beset with hairs which are forked or glochidiate-capitellate (i. e. bidentate at apex and the two lobes recurved or revolute, thus appearing minutely capitate).

* *Bracts of the involucre conspicuously attenuate-acuminate: head large: involucre ½ inch or more high, and rays ½ inch long.*

+ *Caulescent, somewhat hirsute-pubescent, but the foliage at length glabrate: involucre naked; its bracts from lanceolate to ovate-lanceolate: rays showy, bright blue or violet.*

1. **T. eximia,** Gray. Stems erect, simple or sparingly branching, 6 to 14 inches high: leaves spatulate or the upper lanceolate: head sparingly leafy-bracted or naked at base: involucral bracts ovate-lanceolate and *somewhat rigidly cuspidate-acuminate,* whitish-scarious with green centre: *akenes broadly obovate,* almost cartilaginous, *glabrate,* sprinkled with a few short and obscure glochidiate-tipped hairs: pappus wholly persistent, *of 2 subulate at length corneous stout awns which are rather shorter than the akene,* and a circle of rigid scales. — Pl. Fendl. 70. Mountain sides, New Mexico and Colorado.

2. **T. grandiflora,** Nutt. Stems spreading from the base, sometimes divergently branched above, a span or two high: upper leaves often linear, 2 *or more uppermost subtending the head:* involucre nearly of the preceding: *akenes narrowly obovate, sprinkled with glochidiate-capitellate hairs:* pappus in the ray reduced to a crown of short scales, and of the disk *plurisetose and longer than the akene.* — Plains and hills, Wyoming and W. Nebraska to New Mexico.

3. **T. Parryi,** Eaton. Stems erect, simple, stout, *naked and pedunculiform above, 2 to 6 inches high:* leaves mostly spatulate: bracts of the very broad involucre lanceolate, *thinner, with softer and less attenuate tips,* or the outer barely acuminate: *akenes narrowly obovate, canescently pubescent, the hairs acute and simple or many of them 1 to 2-dentate at tip: pappus of the ray plurisetose like that of the disk,* or somewhat more scanty. — Am. Naturalist, viii. 212. Wyoming, Montana, and E. Idaho.

Var. **alpina,** Gray. A dwarf and alpine form, more pubescent and cinerous: leaves very small, at most ½ inch long: flowering stem about the same length or hardly any: involucral bracts less pointed: "rays pink." — Proc. Am. Acad. xvi. 83. Wyoming on the high divide between the Stinking Water and the Yellowstone, *Parry.*

+– +– *Depressed-stemless and monocephalous.*

4. **T. condensata,** Parry. Very lanuginous with long and soft arachnoid hairs, the spatulate-obovate leaves rosulate-crowded around the large and broad sessile head, the whole forming a globular or hemispherical woolly tuft, an inch and a half high and surmounting a slender stoloniform caudex: bracts of the involucre linear and soft, with a weak attenuate apex, all nearly equal in length: rays 100 or more, narrow: pappus of ray and disk plurisetose and long. — Am. Nat. viii. 213. Wyoming, on a high alpine peak of the Owl Creek range, *J. D. Putnam.*

* * *Bracts of the involucre not prominently if at all acuminate: heads mostly smaller or narrower: pappus of the disk and often of the ray plurisetose.*

+– *Hairs on the akene mostly copious and slender, simple or bifid, the lobes ascending or merely spreading: heads middle-sized, more or less naked-pedunculate: the pink or rarely white rays and the involucre each from ⅛ to ½ inch long.*

5. **T. florifer,** Gray. A span or more high, cinereous-hirsute: stems rather slender, leafy: leaves linear or the lowest lanceolate-spatulate, acute, mostly apiculate-acuminate: involucral bracts linear-lanceolate, little unequal. — Proc. Am. Acad. xvi. 84. Montana to Washington Territory and Oregon.

+– +– *Hairs on the akene mostly glochidiate-capitellate.*

++ *Head large, ¾ to 1 inch long without the rays: plants green and glabrous, depressed-acaulescent: leaves large, much surpassing the head.*

6. **T. Wilcoxiana,** Wood. *Leaves linear-spatulate, elongated,* 1 to 3 inches long including the petiole-like base: *head mostly solitary, short-pedunculed or subsessile:* bracts of the involucre *lanceolate or linear,* barely acutish: ray and disk pappus of *similar slender and elongated bristles.* — Bull. Torr Club, vi. 163; Bot. Gazette, iii. 50. Colorado to Arizona and Indian Territory.

7. **T. Rothrockii,** Gray. *Leaves more broadly spatulate and shorter,* an inch long or less, *rosulate around the solitary head which is closely sessile at the surface of the ground,* or at length with one or two additional heads: involucre shorter and broader; its bracts *oblong,* mostly obtuse: ray-pappus of *chaffy bristles not longer than the breadth of the akene.* — Wheeler Rep. vi. 148. In the alpine regions of the mountains of South Park, Colorado.

++ ++ *Heads from ⅓ to ¾ inch long, sessile or rarely on a very short naked peduncle: plants sericeous-pubescent, depressed-acaulescent or -caulescent: ray-pappus mostly plurisetose.*

8. **T sericea,** Hook. *Depressed-acaulescent,* with closely sessile solitary or few heads on the crown next the ground, surrounded and *more or less surpassed* by the linear or linear-spatulate leaves, an inch or two high: *heads an inch or less long:* involucral bracts narrowly lanceolate, *acute:* rays white or purplish: ray and disk of pappus mostly similar. — From New Mexico and Arizona northward in the mountains to British America. Exceedingly variable.

Var. **leptotes,** Gray, has heads less than ½ inch long, all but the primary ones distinctly pedunculate, and the leaves narrowly linear with attenuate base. — Middle Park, Colorado, *Parry.*

9. **T. incana,** Nutt. *Depressed-caulescent* or subcaulescent, an inch to a span high, branching: leaves from narrowly spatulate to almost linear;

uppermost around the sessile (½ *inch*) heads and *seldom surpassing them:* involucral bracts more obtuse: pappus of the ray from ⅓ to ½ the length of that of the disk. — Mountains of Wyoming to Utah and Nevada.

†† †† †† *Heads about ½ inch long: sessile among the rosulate leaves: herbage soft-lanate: pappus deciduous in a ring.*

10. **T. spathulata,** Nutt. Depressed and multicipital, forming a tuft an inch or so high: leaves crowded, spatulate, densely villous-lanate; the upper about equalling the heads: bracts of the involucre oblong-lanceolate, acute: rays rather short, pinkish: pappus of ray and disk similar, of slender bristles. — Mountains of Wyoming.

†† †† †† †† *Heads small, ¼ inch high (exclusive of the rays), mostly short-pedunculate: involucre of broadly lanceolate and barely acute bracts: caulescent and branching: pappus of the ray shorter, commonly of chaffy bristles.*

= *Green and glabrate.*

11. **T. glabella,** Gray. An inch or two high, nearly simple, sparsely pilose-pubescent when young: leaves thickish, soon glabrous, spatulate, an inch or less long, including the usually slender petiole; the uppermost usually surpassed by the slender and naked peduncle: involucre glabrous. — Proc. Am. Acad. xvi. 86. S. W. Colorado, *Newberry.*

= = *Cinereous with fine and close pubescence, flowering from near the ground at first, but becoming taller (4 to 10 inches high) and loosely branching.*

12. **T. Fendleri,** Gray. *Leaves linear:* bracts of the involucre unequal, *in about 3 ranks,* acute. — Pl. Fendl. 70. New Mexico and S. Colorado.

13. **T. strigosa,** Nutt. Flowering when only ½ inch high, often attaining a span in height: *early leaves spatulate;* later ones linear: heads rather smaller: bracts of the involucre *broader,* acutish, *in about 2 ranks,* the outer shorter. — Wyoming to New Mexico and Arizona.

13. ASTER, Tourn. Starwort. Aster.

The largest and by far the most difficult of our genera, not naturally separated from *Erigeron.* All are herbs, mostly perennial, and especially characteristic of North America. Includes *Machæranthera* and *Diplopappus.*

§ 1. *Involucral bracts (at least the outer ones) with green herbaceous tips or appendages, or wholly or partly foliaceous, imbricated or many-ranked, their margins not scarious: akenes from obovate-oblong to linear, 3 to several-nerved: pappus rather fine and soft (in one or two species more coarse and rigid), simple (with no exterior series).* — Aster proper.

* *Involucre well imbricated: the bracts appressed and coriaceous, with more or less spreading herbaceous tips: akenes narrow, 5 to 10-nerved: pappus more rigid than in the following groups: rays showy, blue or violet: leaves firm, acutely serrate, more or less scabrous, none of them cordate or clasping; the radical tapering at base into margined petioles.*

1. **A. Sibiricus,** L. *A span to a foot high,* somewhat cinereous-pubescent or puberulent, or the foliage scabrous: *heads solitary,* terminating the stem or corymbiform branches: leaves oblong-spatulate to broadly lanceolate, 1 *to* 3 *inches long: involucre* 3 *lines high, shorter than the disk;* its bracts narrowly

lanceolate, with mostly acute and loose herbaceous tips: rays 3 or 4 lines long, violet: *akenes pilose-pubescent.* — Mountains of Wyoming and Montana, and far northward.

2. **A. conspicuus,** Lindl. Scabrous: *stem* 2 *feet high, stout, rigid, bearing several or numerous corymbosely cymose heads:* leaves rigid, ovate, oblong, or the lower obovate, *ample,* 4 *to* 6 *inches long: involucre about equalling the disk,* 5 *to* 6 *lines high;* its bracts in several series, *minutely glandular-puberulent,* lanceolate, acute, the greenish tips little spreading: rays ½ inch long, violet *akenes minutely pubescent.* — In the mountains, from the Yellowstone northward.

* * *Involucre and usually branchlets viscidly-glandular, rather well imbricated: rays* 15 *to* 40, *showy, violet to purple: akenes narrow, several-nerved: leaves all entire or the lower with few teeth; cauline all sessile or partly clasping.*

+– *Stem simple: leaves and heads proportionally large: alpine or subalpine.*

3. **A. integrifolius,** Nutt. *Stem a foot or more high,* stout, *sparsely leafy,* villous-pubescent but glabrate, bearing few or several *racemed or thyrsoid heads:* leaves *firm,* oblong to spatulate, 4 *to* 7 *inches long;* the smaller upper ones lanceolate, half-clasping; lowest tapering into a long winged petiole: heads ½ inch high: involucre and branchlets viscid-glandular; its bracts linear, not squarrose: rays bluish purple. — From Colorado to Montana and westward.

4. **A. Kingii,** Eaton. *A span or less high, cespitose: leaves mainly radical,* spatulate, entire, or with few sharp teeth, mucronate, *thinnish,* glabrous or nearly so, 1 *to* 3 *inches long:* flowering stems pubescent and above glandular, *bearing solitary or* 3 to 5 *middle-sized heads:* involucre 4 *or* 5 *lines high, merely puberulent-glandular, hardly at all viscid;* the bracts linear-lanceolate with attenuate and *squarrose-spreading green tips:* rays white. — Bot. King Exp. 141. In the Wahsatch Mountains.

+– +– *Stems branching: leaves comparatively small: neither alpine nor subalpine.*

++ *Involucre of the small and scattered heads not squarrose; the green tips of the bracts more or less erect: slender and low species, a span to a foot or less high.*

5. **A. campestris,** Nutt. *Pruinose-puberulent and viscidulous,* somewhat heavy-scented: leaves linear, about an inch long, a line or two wide, or lower narrowly spatulate, *mostly glabrate,* some obscurely 3-nerved: involucre 3 or 4 lines high, *hemispherical,* of rather few-ranked and *little unequal linear acute bracts:* rays 3 or 4 lines long, light violet or purple. — From Montana and Idaho to Washington Territory and California.

6. **A. Fendleri,** Gray. Rigid, a span to a foot high, *sparsely hispidulous:* the linear one-nerved firm *leaves hispid-ciliate,* otherwise usually smooth and glabrous: involucre *somewhat campanulate,* 3 lines high; *outer bracts shorter, linear-oblong, obtuse,* pruinose-glandular: rays violet, 4 lines long. — Pl. Fendl. 66. *A. Nuttallii,* var. *Fendleri,* Gray. Plains and sand-hills, from W. Kansas to S. Colorado and N. New Mexico.

++ ++ *Involucre of middle-sized heads well imbricated; the unequal bracts with loose squarrose-spreading tips: leaves not rigid, spreading.*

7. **A. Novæ-Angliæ,** L. *Stem stout and strict,* 2 *to* 8 *feet high,* very leafy to the top, *coarsely hirsute or hispid with many-jointed hairs, also with glandular*

pubescence: leaves lanceolate or broadly linear, *pubescent*, 2 to 5 inches long, entire, slightly if at all narrowed below, half-clasping by a strongly auriculate-cordate base: *heads crowded: rays* 50 *to* 60 *or more*, fully half-inch long, *purple.* — From Colorado to the Saskatchewan and eastward.

Var. **roseus,** DC. Rays rose-colored. — Occasionally with the ordinary form.

8. **A. oblongifolius,** Nutt. *About* 2 *feet high: stem hirsute-pubescent*, very leafy, *corymbosely branched:* leaves from narrowly oblong to broadly linear, larger cauline 2 inches long, *somewhat puberulent:* involucre aromatic-scented, the linear bracts granulose-glandular and viscidulous: *rays* 25 *to* 30, *bright violet*, 5 or 6 lines long. Hardly within our range, but represented in Colorado by

Var. **rigidulus,** Gray. Low, more fastigiate, with more rigid and hispidulous scabrous leaves. — Synopt. Fl. i. 179.

* * * *Heads small, paniculate: lower cauline and radical leaves cordate and petioled: no glandular or viscid pubescence: akenes compressed,* 3 *to* 5*-nerved: rays violet, purplish, or white.*

9. **A. sagittifolius,** Willd. Green, from glabrous to sparsely pilose-pubescent: stem strict, 2 or 3 feet high: leaves oblong- and ovate-lanceolate, acutely more or less serrate; radical and lowest cauline narrowly cordate, on naked petioles; upper subcordate or truncate at base and contracted into a winged petiole, 3 to 5 inches long; uppermost linear-lanceolate and sessile: heads densely thyrsoid-paniculate: bracts of the involucre subulate-linear and mostly attenuate, the tips rather loose. — In Dakota within the eastern limit of our range, and extending eastward.

* * * * *No cordate petioled leaves; radical leaves all acute or attenuate at base: not glandular nor viscid nor silky-canescent: akenes compressed, few-nerved.*

+ *Whole plant very smooth and glabrous: heads rather large, showy, with firm closely imbricated appressed green-tipped bracts: leaves on flowering branchlets mostly reduced to rigid subulate bracts: akenes glabrous.*

10. **A. lævis,** L. Rather stout, 2 to 4 feet high, rigid: leaves from ovate or oblong to lanceolate, 4 or 5 inches long, decreasing upward; radical and lowest cauline contracted below into a winged petiole; upper all with auriculate or subcordate partly clasping base: heads sparsely thyrsoid-paniculate, on short and rigid branchlets: involucre campanulate or obscurely turbinate; the whitish coriaceous bracts bearing abrupt rhomboid or deltoid short green tips: rays 20 or 30, broadish, sky-blue verging to violet. — Eastern slopes of the Rocky Mountains and eastward across the continent.

Var. **Geyeri,** Gray. A foot or two high: involucre broader and less imbricated; its bracts of thinner texture, mostly attenuate-acute, the green tip less definite. — Synopt. Fl. i. 183. In the mountains of Idaho and Wyoming and northward.

+ + *Heads rather small* (3 *or* 4 *lines high*), *thyrsoidly or corymbosely arranged; bracts rigid, narrow, with subulate green nearly erect tips: rays numerous, bright white,* 4 *lines long: akenes minutely pubescent.*

11. **A. Porteri,** Gray. A foot or less high, glabrous and smooth (except ciliation of lowest leaves), either simple or branching above: leaves linear or

lower spatulate-linear, 2 to 4 inches long, 1 to 3 lines wide; radical spatulate: heads broad: involucral bracts linear-subulate; outer little shorter than inner. — Proc. Am. Acad. xvi. 99. *A. ericoides*, var. *strictus*, Porter, Fl. Colorad. 56. Common in the Colorado Rocky Mountains.

+ + + *The numerous small heads racemosely arranged: unequal bracts well imbricated, with squarrose or at least spreading herbaceous obtuse or merely mucronate tips: cauline leaves small, linear and entire, scarcely narrowed at the abrupt sessile or partly clasping base: akenes canescent-hirsute: rays white, rarely tinged with blue or purple.*

12. **A. multiflorus,** Ait. Low, a foot or two high, bushy-branched, cinereous or green: leaves rigid, scabrous-ciliate; uppermost passing into involucral bracts; these mostly with obtuse tips: *heads in the ordinary forms little over* 2 *lines long, and with only* 10 *to* 15 *or* 20 *rays.* — From Arizona to British Columbia and eastward across the continent.

13. **A. commutatus.** A foot or so high, with divergent branches: heads more scattered and *twice or even thrice the size* of those of *A. multiflorus*, 3 or 4 lines high and broad: *rays* 20 *to* 30: otherwise nearly as the preceding. — From Saskatchewan and Dakota to Utah and E. Oregon.

+ + + + *Involucre in some imbricated and with short close tips, in others more loose and herbaceous: heads when numerous either thyrsoid or open-paniculate on erect or ascending branches.*

++ *Cauline leaves sessile, but neither with cordate or auriculate base (with* 1 *or* 2 *exceptions), nor with abrupt winged petiole-like lower portion.*

= *Herbage inclined to be glabrous; the branches often pubescent in lines: leaves (at least some of them) serrate or denticulate: stems branching and with several to many heads: none alpine or subalpine: Eastern forms.*

a. *Involucre close and erect; its bracts imbricated in successive lengths.*

14. **A. paniculatus,** Lam. Stem 2 to 8 feet high, freely and paniculately branched: leaves from *elongated oblong* to narrowly lanceolate, mostly attenuate-acuminate, *sharply serrate or denticulate,* or upper entire, *thin:* heads about ⅛ inch high, *in loose and open mostly leafy panicles:* bracts of the involucre narrowly linear, *with tapering acute or acuminate green tips:* rays 3 or 4 lines long, *white* varying to purplish or violet. — A very polymorphous species, including also part of the forms heretofore included under *A. Tradescanti, simplex, tenuifolius,* and *carneus.* From E. Montana to Louisiana and eastward; abundant in the Northeastern States.

15. **A. salicifolius,** (Lam. ?) Ait. Resembles the preceding, equally branching: leaves commonly *less elongated, less serrate or entire, of firmer texture,* apt to be scabrous, and the fine reticulation of the veinlets manifest: *involucre more imbricated;* its bracts firmer, linear, *with shorter and more definite green tips, these acute or obtusish:* heads *disposed to be thyrsoid or racemose-glomerate* on the ascending branches: rays *purplish to violet,* rarely white. — Includes *A. carneus,* in part. From E. Montana to Texas and northeastward; most abundant in the Mississippi Valley.

b. *Involucre loose, and less imbricated; its bracts about equal.*

16. **A. junceus,** Ait. Slender, 1 to 3 feet high, the smaller plants simple-stemmed and with few heads, smooth and nearly glabrous: *leaves linear or*

nearly so, 3 to 5 inches long, 2 to 4 lines wide, entire, or lower with rare denticulations: *involucre 3 lines high;* its bracts all small, narrowly linear and erect, thinnish, *manifestly imbricated in 2 or 3 series, and the outer more or less shorter* (thus connecting with *A. paniculatus* of the preceding subdivision): rays light violet-purple, 4 or 5 lines long. — *A. æstivus*, Gray, Man. mainly. Wet meadows in the mountains north to the British possessions, and thence eastward.

17. **A. longifolius,** Lam. A foot to a yard high, glabrous or pubescent, leafy: *leaves elongated-lanceolate to linear-lanceolate*, entire or sparingly serrulate, 3 to 7 inches long, tapering to both ends: *involucre 4 or 5 lines high, little or not at all imbricated; its bracts all of nearly equal length:* rays 3 or 4 lines long, violet or purplish, rarely almost white. — Low moist grounds, Montana to Labrador, and south to New England.

= = *Inclined to be pubescent or scabrous, at least in the upper parts of the stem, which is often monocephalous: leaves entire or nearly so: frequently alpine or subalpine: Western forms.*

a. *Involucre conspicuously and regularly imbricated, of oblong-linear or spatulate bracts; outer bracts successively shorter; all loosely erect or little spreading, with mostly obtuse and broadish tips.*

18. **A. adscendens,** Lindl. A span to two feet high, rather rigid, from nearly glabrous to strigulose: stems commonly branching, bearing few or rather numerous loosely paniculate or subcorymbose heads (4 or 5 lines high): leaves of firm and thickish texture, linear to spatulate-lanceolate, with margins commonly ciliate or scabrous: bracts of the hemispherical involucre moderately unequal and in comparatively few ranks: rays 3 or 4 lines long, violet or purple. — From New Mexico and Arizona to Nevada, Montana, and the Saskatchewan.

b. *Involucre more or less imbricated but looser; the bracts all narrow (linear or subulate), thinnish, from moderately to hardly unequal, loosely erect, mostly acute, with not at all broadened tips, nor with the outermost foliaceous.*

1. *Low, 1 to 2 feet high or less, with solitary or few heads: chiefly in the mountains and northward.*

19. **A. Andinus,** Nutt. *Dwarf, with decumbent stems 2 or 3 inches long* from filiform creeping rootstocks; bearing a solitary comparatively large head: *leaves ½ inch long;* radical and lower cauline spatulate; cauline (2 or 3) linear-lanceolate: heads 4 lines high: rays (35 to 40) violet. — In the mountains of Wyoming, near perpetual snow, *Nuttall.* Not since found; thought possibly to be an alpine state of the following.

20. **A. Fremonti,** Gray. *A span to a foot or more high,* glabrous or nearly so: *stem* slender, *erect:* leaves with margins either quite naked and smooth or obscurely scabrous; radical and lowest cauline oblong or oblanceolate, or somewhat obovate, *inch or two long,* and tapering into a slender margined petiole; cauline from oblong-lanceolate to linear, commonly half-clasping at base: heads solitary in the smaller specimens, several in the larger, one third to half an inch high, somewhat naked-peduncled: bracts of the involucre narrowly linear, some of the outer shorter. — Synopt. Fl. i. 191. *A. adscendens,* var. *Fremonti,* Torr. & Gray. In the mountains below the alpine region from Colorado to Montana and westward to the Sierra Nevada and Cascades.

2. *Tall, 3 to 8 feet high, paniculately polycephalous: in low grounds and to the south.*

21. **A. hesperius,** Gray. From nearly glabrous and smooth to scabrous-pubescent: leaves lanceolate, entire or the larger with a few denticulations, 2 to 5 inches long, 3 to 8 lines wide: heads rather crowded, 4 or 5 lines high: involucre of narrowly linear or more attenuate erect bracts, either unequal and imbricated, or with some loose and slender exterior ones which equal the inner: rays either white or violet, 3 or 4 lines long. — Synopt. Fl. i. 192. S. Colorado and New Mexico to Arizona and S. California. Has been taken for *A. longifolius, Novi-Belgii, æstivus,* etc.

c. *Involucre loose and with conspicuous foliaceous outer bracts, which equal the inner, either ascending or squarrose.*

22. **A. foliaceus,** Lindl. Smooth and glabrous, or upper part of stem pubescent: leaves from broadly lanceolate to oblong and the lower spatulate; upper cauline very commonly with partly clasping and sometimes even sub-cordate-auriculate base: heads ½ inch high: involucre with lanceolate or broadly linear outer bracts: rays violet or purple, in the larger heads nearly ½ inch long. — In the Pacific States from California to Alaska, extending eastward into our range under the following forms.

Var. **frondeus,** Gray. Stem simple or with sparing erect flowering branches, sparsely leaved: leaves comparatively ample, 4 or 5 inches long; lower tapering into winged petioles, upper often with clasping base: heads solitary or few, naked-pedunculate, broad: involucral bracts linear-lanceolate, loose and not imbricated, all equalling the disk, occasionally the outermost broader and leaf-like. — Synopt. Fl. i. 193. *A. adscendens,* var. *Parryi,* Eaton. Subalpine, from the borders of British Columbia to those of Colorado.

Var. **apricus,** Gray. Like a dwarf state of the preceding variety, growing in exposed places, somewhat rigid, thicker-leaved: stems ascending from tufted rootstocks, a span or two high, bearing solitary or 2 to 3 broad heads: involucral bracts all alike, somewhat spatulate-linear, obtuse or acutish: rays "deep blue-violet and reddish-purple intermixed." — Loc. cit. High mountains of Colorado, and in Washington Territory.

Var. **Parryi,** Gray. Includes some ambiguous forms, seemingly between the preceding variety and *A. Fremonti,* with stems a span to a foot high, with smooth and thickish rather large leaves, mostly naked heads; the involucre sometimes foliaceous-bracteate in the manner of the present species, sometimes wholly of the narrow and closer bracts of *A. Fremonti.* — Loc. cit. Mountains of Colorado, subalpine, and S. Wyoming.

Var. **Burkei,** Gray. A foot or two high, rather stout, simple or branched above, leafy to the top: leaves thickish, very smooth, ample; upper cauline mostly oblong, and with broadly half-clasping usually auriculate insertion: heads solitary or several, very broad: involucre of oblong or spatulate and obtuse loosely imbricated bracts, the outer commonly shorter, or outermost sometimes more foliaceous and equalling the disk. — Loc. cit. Rocky Mountains, *Burke;* also in Washington Territory, the Wahsatch, New Mexico, and Arizona.

Var. **Canbyi,** Gray. Like the preceding form in foliage, apparently tall and stout (base of stem and lower leaves wanting), leafy throughout the

thyrsoid panicle of numerous subsessile heads: upper leaves rather broadly oblong and with broad half-clasping base obscurely auriculate: bracts of the involucre imbricated, with small and erect lanceolate green tips, only in some heads a few of the outermost loose and foliaceous, but seldom equalling the disk. — Loc. cit. *A. Canbyi*, Vasey. On White River in Western Colorado, *Vasey*.

Var. **Eatoni**, Gray. Rather tall, 2 or 3 feet high, branching, bearing numerous and smaller paniculate or glomerate heads, and comparatively narrow lanceolate leaves: involucre loosely imbricated; outer and sometimes inner bracts foliaceous, either erect or squarrose-spreading. — Loc. cit. 194. British Columbia to California and northeastward to Montana.

++ ++ *Base of most of the cauline leaves auriculate- or cordate-clasping.*

23. **A. puniceus**, L. Stem commonly 3 to 7 feet high, loosely branching above, rather stout, often red or purple, hispid with spreading bristles: leaves 3 to 6 inches long, oblong-lanceolate, acuminate, from coarsely and irregularly serrate to sparingly denticulate or sometimes entire, commonly scabrous above and often hispid along the midrib beneath: heads (4 to 6 lines high) subsessile, either sparsely paniculate or thyrsoid-crowded: involucre of loose and thin soft and narrowly linear merely herbaceous bracts: rays ½ inch long, violet, varying to purple or occasionally white. — Throughout the Eastern States and extending into our range through Dakota.

§ 2. *Pappus double: involucral bracts narrow and appressed, well imbricated: rays* 10 *to* 18, *violet: akenes narrow, villous: low and tufted plants, with rigid stems thickly beset with small linear or lanceolate entire and rigid leaves.* — IANTHE.

* *Head ½ inch high, broad, solitary: akenes flat, with strong nerves.*

24. **A. scopulorum**, Gray. *Puberulent and somewhat cinereous:* stems tufted, rigid, only a span high, terminated by a solitary pedunculate head: *leaves short*, 3 *to* 6 *lines long*, rigid, *from oblong to linear or the lowest spatulate*, the broader obtuse with an abrupt mucro, *callous-margined:* involucre broadly campanulate; its bracts *imbricated in about* 3 *series*, scabro-puberulent, lanceolate: rays ½ inch long, light violet: outer pappus sometimes distinctly chaffy. — Proc. Am. Acad. xvi. 98. *Diplopappus alpinus*, Nutt. Mountains of Montana and Wyoming to Nevada and California.

25. **A. stenomeres**, Gray. More slender, 6 to 10 inches high, *green*, minutely scabrous: solitary naked pedunculate *head larger: leaves all linear*, ½ *to* 1 *inch long*, a line wide, acutely mucronate, hardly margined: involucre broad; its bracts barely *in two moderately unequal series*, linear, thinnish, often pubescent: rays pale violet, over ½ inch long: *outer pappus setulose.* — Proc. Am. Acad. xvii. 209. — Mountains of Montana and Idaho.

* * *Heads ⅓ to ¼ inch high, narrow: akenes less compressed, lightly few-nerved: outer pappus of few or indistinct unequal short bristles.*

26. **A. ericæfolius**, Rothrock. About a span high, canescent and glandular-scabrous, much branched: branches erect or diffuse, terminated by somewhat pedunculate heads: leaves commonly hispid-ciliate, erect or little spreading, 3 to 6 lines long; lowest spatulate and tapering into a petiole;

upper from linear to nearly filiform: bracts of the involucre in about 3 series, lanceolate, acute or apiculate, thinnish, scarious-margined: rays purple or violet, sometimes white. — Bot. Gazette, ii. 70. *Diplopappus ericoides*, Torr. & Gray. From Kansas and Texas to Utah, Arizona, and California.

§ 3. *Pappus simple: bracts of the involucre imbricated and appressed, destitute of foliaceous or herbaceous tips, often scarious-edged or more or less dry: rays fertile: leaves mostly entire.* — ORTHOMERIS.

* *Involucre well imbricated, of small and narrow bracts, greener than in others of this section: low and slender herbs, leafy-stemmed, branching above; with linear erect leaves, and several small white-rayed heads: akenes not compressed, very glabrous.*

27. **A. ptarmicoides,** Torr. & Gray. Rather rigid, 6 to 20 inches high in a tuft, from smooth to puberulent, bearing a corymbiform cyme of several or numerous heads: leaves firm, linear or the lower spatulate-lanceolate: bracts of the involucre oblong-lanceolate, obtuse, thickish, rather rigid: rays 2 to 4 lines long, broadish: pappus white, of rather rigid bristles, longer ones manifestly clavellate at tip. — From Colorado to the Saskatchewan and New England.

* * *Involucre appressed-imbricated in several series of ovate or ovate-lanceolate dry chartaceous bracts: akenes compressed, more or less pubescent: stems leafy, bearing several or solitary pedunculate heads.*

+– *Involucral bracts thin, acute, commonly tomentose (at least when young): akenes hirsute, becoming glabrate: heads showy, 4 to 6 lines high.*

28. **A. Engelmanni,** Gray. Rather tall and robust, green, *puberulent to glabrous: leaves thin*, ovate-oblong to broadly lanceolate, 2 *to* 4 *inches long*, the larger sometimes with a few small teeth, upper acuminate: heads ½ inch high: *involucral bracts acute or acuminate;* some outer ones *partly herbaceous, or with loose pointed tips;* inner purplish: *rays* ½ *inch long.* — Am. Jour. Sci. II. xxxiii. 238. *A. elegans*, var. *Engelmanni*, Eaton. Mountains of Colorado, Utah, and Wyoming, to the Cascades.

29. **A. elegans,** Torr. & Gray. Slender, 1 to 3 feet high, *mostly scabro-puberulent: leaves thickish*, pale, lanceolate, *inch or two long*, erect, the upper apiculate-mucronate: heads several at summit of simple stem or branches, comparatively small and few-flowered, 4 *or* 5 *lines high: involucral bracts all close and conspicuously woolly-ciliate, barely acute*, outer ovate, *none with pointed tips:* rays rather few, *about* 4 *lines long.* — Fl. ii. 159. Mountains of Wyoming and Montana to Nevada and Oregon.

+– +– *Involucral bracts firmer, glabrous, all the outer obtuse: akenes merely pubescent: heads smalier,* 3 *lines high.*

30. **A. glaucus,** Torr. & Gray. Throughout smooth and glabrous, glaucescent or pale: stems a foot high from extensively creeping filiform rootstocks, branching, bearing several or numerous paniculate heads: leaves thickish, lanceolate, 1 to 3 inches long, ¼ to ½ inch broad, rather obtuse: involucre imbricated in about 3 ranks: rays bright violet, 4 to 6 lines long. — Fl. ii. 150. Mountains of Wyoming to Colorado and Utah.

* * * *Involucre less imbricated, hemispherical; the bracts partly greenish, in few ranks, with or without scarious margins: low-stemmed or acaulescent, from a thick rootstock, with solitary or few pedunculate heads, ½ inch or more high: leaves thickish and narrow.*

+– *Heads terminating short leafy stems which arise from creeping and woody rootstocks: involucral bracts acuminate and mucronate-tipped: akenes oblong, very villous.*

31. **A. Parryi,** Gray. *Tomentose-pubescent and cinereous,* a span high: leaves mostly spatulate and obtuse with a mucronate point, an inch or more long: *heads usually solitary on peduncle surpassing the leaves, very broad: bracts of the involucre oblong-lanceolate,* densely cinereous-pubescent: *rays white, over ½ inch long.* — Am. Nat. viii. 212. Mountains of Wyoming.

32. **A. Xylorrhiza,** Torr. & Gray. *Less pubescent and glabrate,* 4 to 8 inches high: leaves from narrowly spatulate-lanceolate to linear, 1 or 2 inches long, 1 to 3 lines wide; *the upper commonly equalling the* 1 *to* 3 *peduncles: heads smaller:* involucral bracts more attenuate: rays "pale red" or "pale rose-color," 4 *lines long.* — Mountains of Wyoming.

+– +– *Heads (large for the plant) solitary on simple and scapiform stems, which with the cluster of narrow radical leaves rise from a thickened caudex: involucral bracts acutish: akenes linear, glabrate: pappus strongly denticulate.*

33. **A. pulchellus,** Eaton. Stems 2 to 4 inches long: radical leaves from spatulate to narrowly linear, 1 to 2 inches long, obtuse, in our form only a line wide: akenes striate. — Bot. King. Exp. 143. Alpine from Wyoming and Montana to Oregon and Washington Territory.

* * * * *Involucre little imbricated, with peduncles and upper part of stem viscid-glandular: heads ¼ inch high, with conspicuous violet or purple rays.*

34. **A. pauciflorus,** Nutt. Stem 6 to 20 inches high from a slender creeping rootstock, simple and bearing few heads, or branching above: leaves moderately fleshy, linear, or radical subspatulate or elongated-lanceolate, uppermost reduced to bracts: bracts of short hemispherical involucre rather fleshy and green, moderately unequal and rather loose, in only 2 or 3 ranks: akenes narrow, compressed, striate-nerved, appressed-pubescent. — In saline soil from New Mexico and Arizona to Utah, and eastward to Dakota and the Saskatchewan.

§ 4. *Involucre of* 2 *or* 3 *series of linear nearly equal bracts; the outer foliaceous, resembling the upper leaves: ray-flowers with the ligule generally wanting: akenes narrow, not compressed, appressed-pubescent: pappus simple, very soft.* — CONYZOPSIS.

35. **A. angustus,** Torr. & Gray. A span to a foot high, branching, leafy-stemmed, nearly glabrous, except that the linear chiefly entire leaves are somewhat ciliate: numerous rather small heads disposed to be racemose-paniculate: bracts of the involucre acute: corolla of the ray-flowers reduced to the tube and much shorter than the elongated style. — Fl. ii. 162. Wet saline soil from Colorado and Utah to the Saskatchewan and Minnesota.

§ 5. *Involucre imbricated in many rows; the bracts linear, coriaceous below, with foliaceous spreading tips: rays numerous and conspicuous, violet or bluish purple: akenes narrowed downward, compressed: receptacle honeycombed:*

pappus copious and simple, of rather rigid and unequal bristles: leafy-stemmed and branching, the showy heads terminating the branches, the involucre canescent or even viscid, and the leaves from dentate to bipinnately-parted. — MACHÆRANTHERA.

* *Involucre densely hispidulous as well as viscid, very squarrose: akenes glabrous or glabrate: leaves from incisely dentate to entire, the teeth hardly at all bristle-tipped: rays bright violet.*

36. **A. Pattersoni,** Gray. A span or two high, *branched from the summit of the tap-root:* stems or branches *with soft or cottony pubescence* or glabrate: leaves thickish, *spatulate or lingulate, entire or coarsely few-toothed, none widened at base:* heads solitary or few: *involucral bracts lanceolate:* rays about 30, fully ½ inch long. — Proc. Am. Acad. xiii. 272. *Machæranthera canescens*, var. *alpina*, Porter, Fl. Colorad. 59. Moist ground along streams, Gray's Peak, Colorado.

37. **A. Bigelovii,** Gray. A foot or two high, robust: stem leafy, *branching above, roughish-hirsute to glabrate; the flowering branches or peduncles glandular-hirsute*, terminated by showy large heads: leaves *oblong or lanceolate, irregularly and sometimes incisely dentate*, sometimes entire; radical lanceolate-spatulate; cauline oblong to lanceolate, *usually with broadish partly clasping base:* involucral bracts very numerous, *linear-attennate* or the prolonged and much recurved tips almost filiform: rays very many, an inch or less long. — Pacif. R. Rep. iv. 97. Colorado and New Mexico.

* * *Involucre from nearly glabrous to glandular-puberulent, but not hispidulous: akenes densely pubescent or villous: leaves generally with bristle-tipped teeth.*

+– *Leaves at most incisely dentate.*

38. **A. Coloradoensis,** Gray. A span or less high, *forming a tuft of short few-leaved stems on a strong tap-root*, canescently pubescent, not at all glandular: leaves spatulate or oblanceolate, about an inch long, *coarsely dentate*, the teeth tipped with conspicuous bristles: *heads solitary*, broadly hemispherical, ½ inch high: involucral bracts small and numerous, well imbricated, subulate-lanceolate: rays 35 to 40, violet-purple, barely ½ inch long: akenes densely canescent-villous, ½ the length of the comparatively rigid pappus. — Proc. Am. Acad. xi. 76. Common in South Park, Colorado, and at the San Juan Pass.

39. **A. canescens,** Pursh. Commonly a foot or two high and *loosely much branched, bearing numerous paniculate heads*, sometimes dwarf and with simple contracted inflorescence, pale and cinereous-puberulent or minutely canescent, or greener and glabrate: leaves lanceolate to linear, or the lower spatulate, *from entire to irregularly dentate, or occasionally laciniate*, the rigid teeth mostly with mucronate tip: involucre of rigid usually well-imbricated bracts: rays violet, 4 or 5 lines long: akenes narrow, canescent. — Fl. ii. 547. *Machæranthera canescens* and *M. pulverulenta* of the Western Reports. A polymorphous species. From Arizona to Texas and northward to British Columbia and the Saskatchewan.

Var. **latifolius,** Gray. Green, minutely soft-pubescent, 2 feet or more high: leaves thinnish, nearly membranaceous, comparatively large, sometimes spatulate-oblong, and over ½ inch wide: heads large and few: involucre hemispherical; tips of its bracts mostly attenuate-subulate and squarrose-

spreading, canescent and obscurely glandular. — Synopt. Fl. i. 206. *Machæranthera canescens*, var. *latifolia*, Gray. New Mexico, Arizona, and Colorado.

Var. **viscosus**, Gray. Canescent or cinereous: leaves narrow, rather rigid; the upper mostly entire, the lower coarsely dentate: involucre campanulate or turbinate, squarrose; the prominent foliaceous tips of the bracts viscid-glandular, either spreading or recurved. — Loc. cit. Wyoming to California.

+– +– *Leaves* 1 *to* 3-*pinnately cleft or parted: involucre hemispherical, its bracts mostly looser: stem diffusely branched.*

40. **A. tanacetifolius**, HBK. Pubescent or viscid, very leafy, a foot or two high: lowest leaves 2 to 3-pinnately parted; uppermost simply pinnatifid or on the flowering branchlets entire: heads ½ inch high: bracts of the involucre narrowly linear, with slender mostly linear-subulate spreading foliaceous tips, or the outermost almost wholly foliaceous: rays numerous, ½ inch long or more, bright violet: akenes rather broad, villous. — *Machæranthera tanacetifolia*, Nees. From Nebraska to Texas and westward to Arizona and California.

14. ERIGERON, L. Fleabane.

Heads disposed to be solitary and long-pedunculate; rays variously colored; disk-flowers yellow, not changing to purple: akenes generally 2-nerved.

§ 1. *Rays elongated and conspicuous, wanting in a few species, occasionally abortive in one or two: no rayless female flowers between the proper ray and disk.* — Euerigeron.

* *Commonly dwarf from a multicipital caudex, alpine or subalpine, with rather large and mostly solitary heads: involucre loose and spreading, and copiously lanate: rays about* 100, *narrow: leaves entire.*

1. **E. uniflorus**, L. Stems an inch to a span or two high, *few-leaved*, often naked and pedunculiform at summit: radical leaves spatulate or oblanceolate, *inch or two long;* cauline lanceolate to linear: *involucre usually hirsute as well as lanate*, occasionally becoming naked; the linear acute bracts rather close, or merely the short tips spreading: *rays purple* or sometimes white, 2 or 3 or rarely 4 lines long. — Alpine, from Colorado and California northward and across the continent in high latitudes.

2. **E. lanatus**, Hook. Stems about a span high, *scapiform or few-leaved:* radical leaves spatulate to obovate, *about ½ inch long*, tapering into a narrowed base or into a slender margined petiole; some primary ones occasionally palmately 3-lobed; cauline one or two, small and linear, or hardly any: head not larger than that of the last, and involucre similar, *but densely soft-lanate:* rays rather broader, 3 lines long, *white*. — Alpine in Montana and British Columbia.

3. **E. grandiflorus**, Hook. Stems a span or two high, rather stout, *usually several-leaved:* radical leaves obovate-spatulate, an inch or so long; *cauline oblong to lanceolate*, usually ½ inch or less long: *heads larger:* involucre ½ inch high, *very woolly;* its linear and *attenuate-acuminate bracts squarrose-spreading* or the tips recurved: rays violet or purple, ⅓ to ½ inch long. —

Rocky Mountains, in or near the alpine region, from British Columbia to Colorado.

Var. **elatior,** Gray. A foot or two high, *leafy up to the* 1 *to* 4 *pedunculate heads,* pubescent, but hardly hirsute: leaves oblong to ovate-lanceolate, 2 to 4 inches long; cauline closely sessile by a broad base: involucre fully ½ inch high: rays ½ inch long. — Am. Jour. Sci. II. xxxiii. 237. Subalpine and lower, in the mountains of Colorado.

* * *Perennials from a rootstock or caudex, neither stoloniferous nor flagelliferous: involucre from hispid or villous to glabrous, but not lanate.*

+ *Comparatively tall and large (a foot or more high), leafy-stemmed, glabrous to soft-hirsute: leaves rather large, entire or occasionally toothed: heads rather large, with numerous rays: mountain forms.*

++ *Rays* 50 *to* 70, *comparatively broad: involucre rather loose: heads solitary or on larger plants few and corymbosely disposed: pappus simple.*

4. **E. salsuginosus,** Gray. Stem 12 to 20 inches high, the summit or peduncles more or less pubescent: no bristly or hirsute hairs: *leaves very smooth and glabrous, bright green, thickish;* radical and lower cauline spatulate to nearly obovate, with base attenuate into a margined petiole; upper cauline ovate-oblong to lanceolate, sessile, *conspicuously mucronate;* uppermost small and bract-like: bracts of the involucre loose or even spreading, *linear-subulate or attenuate, viscidulous, at most puberulous:* disk over ½ inch in diameter: *rays purple or violet,* ½ inch or more long. — Proc. Am. Acad. xvi. 93. Alpine, from New Mexico and California to the far north.

Var. **glacialis,** Gray. A span high, few-leaved, monocephalous: leaves smaller. — Synopt. Fl. i. Pt 2. 209. Alpine region of the Rocky Mountains.

5. **E. Coulteri,** Porter. Stem 6 to 20 inches high, equally leafy, bearing solitary or rarely 2 or 3 slender-pedunculate heads: leaves *membranaceous,* obovate to oblong, either entire or *serrate with several sharp teeth, pilose-pubescent* to glabrous, *cauline hardly mucronate:* disk about ½ inch wide: involucre *less attenuate* and spreading, obscurely viscidulous *but hirsute with spreading hairs:* rays rather narrowly linear, ½ inch or more long, *white,* varying to purplish. — Fl. Colorado, 61. Mountains of Colorado, Utah, and California.

++ ++ *Rays* 100 *or more and narrow: involucre closer: pappus more or less double, but the exterior minute: stems erect, tufted, generally leafy to the summit and bearing few to several heads: leaves entire: mountain forms but not alpine.*

6. **E. macranthus,** Nutt. From *hirsute-pubescent* to nearly glabrous, *more leafy than the next:* stem 10 to 20 inches high: leaves from lanceolate to ovate; upper often reduced in size: *involucre glabrous* or nearly so, but commonly minutely glandular: *rays ½ inch long:* short outer pappus *sometimes nearly chaffy.* — Mountains from Wyoming to New Mexico and Utah.

7. **E. glabellus,** Nutt. From partly glabrous to *copiously hirsute, disposed to be naked above:* stems 6 to 20 inches high: leaves lanceolate or the lowest somewhat spatulate; upper linear-lanceolate and gradually reduced to subulate bracts: *heads considerably smaller: involucre strigosely hirsute or pubescent:* rays violet, purple, and rarely white, ⅓ *to* ½ *inch long: outer pappus setulose.* — From Colorado and Utah northward and eastward.

Var. **mollis,** Gray. Somewhat cinereous with a soft and short spreading pubescence, a foot or two high, leafy to the top: leaves oblong-lanceolate: cinereous pubescence of the involucre soft and spreading. — Proc. Acad. Philad 1863, 64. Mountains of Colorado.

+– +– *Low, rarely a foot high, conspicuously hispid or hirsute with spreading bristly hairs: leaves entire, narrow: involucre close: rays numerous, occasionally wanting: pappus conspicuously double.*

++ *Sparingly branched stems from the crown of a tap-root, more or less leafy: heads middle-sized: disk ⅓ to ½ inch in diameter: involucre hispid: rays* 50 *to* 80, *occasionally wanting in the second species.*

8. **E. pumilus,** Nutt. Radical and lower cauline leaves from spatulate-linear to lanceolate, a line or two wide; upper linear: *rays white,* 4 lines long: *outer pappus of short bristles* little or not at all thicker than the inner ones and more or less intermixed with them. — Dry plains, Dakota to Colorado, and in the mountains to Utah.

9. **E. concinnus,** Torr. & Gray. Like the preceding, but usually with *more dense and shaggy hirsuteness* and less rigid leaves: stems not rarely somewhat copiously branched: *rays violet or blue,* rarely white: *outer pappus conspicuous* and *chaffy.* — Fl. ii. 174. In arid regions from New Mexico and Arizona to Wyoming and British Columbia.

Var. **aphanactis,** Gray. Discoid, the rays being nearly destitute of ligule or wanting. — Proc. Am. Acad. vi. 540. — Colorado to Nevada and California.

++ ++ *More branched and leafy, over a span high; with smaller heads, fewer rays, and somewhat naked involucre more imbricated.*

10. **E. Brandegei,** Gray. A very imperfectly known plant, green, sparsely hispidulous-hirsute: radical leaves spatulate-linear; cauline linear and small, or upper minute: bracts of involucre short-linear, almost naked: rays 30 or more, white: outer pappus of coriaceous chaffy scales, which are commonly confluent with the scanty bristles of the inner. — Synopt. Fl. i. Pt. 2. 210. Adobe plains, S. W. Colorado, on the borders of New Mexico, *Brandegee.*

+– +– +– *Dwarf, cespitose from a multicipital caudex, with monocephalous flowering stems: radical leaves dissected: pappus simple.*

11. **E. compositus,** Pursh. From hirsute to glabrate, with slender margined petiole setose-ciliate: radical leaves much crowded on the crowns of the caudex, usually 1 to 3-ternately parted into linear or short and narrow spatulate lobes, the few on the erect flowering stems 3-lobed or entire and linear: involucre 3 or 4 lines high, sparsely hirsute: rays from 40 to 60, not very narrow, white, purple, or violet, mostly 3 or 4 lines long. — Alpine regions, from S. Colorado and California to British Columbia and northward.

Var. **discoideus,** Gray. Rays wanting or abortive: head commonly smaller. — Am. Jour. Sci. II. xxxiii. 237. — Same range as the type.

Var. **trifidus,** Gray. Small blade of leaves simply 3 to 5-fid: the lobes from oblong to obovate. — Proc. Am. Acad. xvi. 90. *E. trifidus,* Hook. Mountains, N. Colorado to British Columbia.

Var. **pinnatisectus,** Gray. Usually a large form: numerous violet-purple rays 5 lines long: leaves pinnately parted into 9 to 11 linear and entire or rarely 2 to 3-cleft divisions. — Loc. cit. Mountains of Colorado.

+ + + + *Dwarf or low species, alpine, entire-leaved, cespitose from a multicipital caudex, no fine pubescence, monocephalous: leaves few on the simple stems, at least the radical broader than linear: rays numerous and not very narrow: pappus simple or nearly so.*

++ *Involucre glabrous but pruinose-glandular, brownish purple: smooth and green.*

12. **E. leiomerus,** Gray. A span high, smooth and very glabrous: leaves bright green, mainly radical and spatulate, very obtuse, from 2 to 6 lines wide; cauline only 2 or 3 and smaller: involucre 3 lines high, close; the bracts lanceolate and not attenuate: rays about 40, linear, violet, 3 or 4 lines long. — Synopt. Fl. i. 211. *Aster glacialis* in Bot. King Exp. Mountains of Colorado, Utah, and Nevada.

++ ++ *Involucre hirsute or pubescent, greenish.*

13. **E. ursinus,** Eaton. A span or two high, *loosely cespitose:* leaves duller green, *mostly smooth* and glabrous, but their margins more or less hirsute-ciliate, *spatulate to narrowly oblanceolate;* cauline ones lanceolate or linear and acute: *involucre* (3 *lines high*) *and naked summit of flowering stem hirsute-pubescent:* rays 40 or 50, *purple*, narrowly linear, 3 *lines long.* — Bot. King Exp. 148. Alpine and subalpine, mountains of Wyoming to S. Colorado, Utah, and California.

14. **E. radicatus,** Hook. A span high or less, *densely tufted: leaves all spatulate-linear* or somewhat wider, broadest a line or two wide, *hirsute or hirsutely ciliate*, or sometimes almost naked, then glabrous; *no glandular roughness:* involucre more or less villous-pubescent, *barely* 3 *lines high: rays white or purple*, 2 *or* 3 *lines long.* — Alpine or subalpine, from British America to Wyoming, S. Colorado, and Utah.

15. **E. glandulosus,** Porter. Cespitose from a stout caudex, a span to a foot high, rigid, *granulose-glandular* or *glandular-scabrous*, and with sparse or hispid hairs, especially on the margins of the leaves: leaves thickish, spatulate to linear-oblanceolate, 1 to 3 inches long: *head* 4 *or* 5 *lines high: involucre glandular or viscid as well as pubescent:* rays 40 or 50, violet or purple, 4 *to* 6 *lines long.* — Fl. Colorado, 60. Mountains of Colorado.

+ + + + + *None truly alpine; with entire leaves, not hispidly hirsute: involucre close, disposed to be imbricated and rigid: rays not very numerous or wanting.*

++ *A span or two high: leaves only few and narrow on the simple or sparingly branched stems; but radical ones with obovate or spatulate blade* ½ *inch long: rays* 18 *to* 30, *pale violet or purple: akenes compressed,* 2 *to* 3*-nerved: pappus nearly simple.*

16. **E. tener,** Gray. Canescent with very fine pubescence: stems several from a caudex, weak and ascending, bearing single or 2 or 3 heads: involucre minutely canescent; its narrow and close bracts unequal, somewhat in 2 or 3 ranks: rays 25 to 30. — Proc. Am. Acad. xvi. 91. High mountains of Utah and California to those of Wind River, Montana.

++ ++ *A span to near a foot high, cespitose, silvery-canescent, with simple and monocephalous stems: leaves from narrowly spatulate to linear: rays* 40 *or*

50, *white or purple changing to white: akenes slender and nearly terete, 8 to 10-nerved or striate: pappus double; the outer subulate and conspicuous.*

17. **E. canus,** Gray. Silvery appressed pubescence obviously strigulose under a lens, that of the involucre loose and spreading: stems 4 to 9 inches high, leafy: linear cauline leaves gradually diminishing upward; radical spatulate-lanceolate or narrower: head 4 lines high: rays narrow, 3 lines long: akenes glabrous. — Pl. Fendl. 67. N. New Mexico and Colorado; also on the Platte in Wyoming.

++ ++ ++ *Either low or comparatively tall, leafy-stemmed or somewhat scape-like: akenes compressed, 2 or 3-nerved.*

= *Leaves all narrowly linear to filiform, the broadest not over a line wide: involucre 3 or 4 lines high, of equal bracts.*

18. **E. ochroleucus,** Nutt. Low, a span or two high, somewhat cespitose, from pubescent to glabrate: stems usually simple, naked above and mostly monocephalous: leaves rather rigid, the radical 2 or 3 inches long: involucre hirsute-pubescent: rays 40 to 60, "ochroleucous," white or purplish: outer pappus setulose. — Gravelly soil, N. Wyoming and Montana to Idaho.

= = *Leaves from narrowly linear to oblong.*

a. *Stems naked above, mostly simple and monocephalous, a span or two high: pappus simple.*

19. **E. Eatoni,** Gray. Stems several from the crown of a strong tap root, slender and weak, diffuse, 3 to 9 inches long, simple or with 2 or 3 monocephalous branches: leaves all linear, thickish, minutely pubescent; radical about 2 inches long and the broadest 2 lines wide: heads only 3 lines high: bracts of the sparsely hirsute involucre little unequal: rays seldom over 20, at most 3 lines long, white or purplish. — Proc. Am. Acad. xvi. 91. *E. ochroleucus,* Eaton, Bot. King Exp. 152. Mountains of Colorado, Wyoming, and Utah.

b. *Stems more leafy and disposed to branch, but sometimes monocephalous: pubescence cinereous: outer pappus setulose, sometimes obscure or none.*

20. **E. cæspitosus,** Nutt. *Low, a span to rarely a foot high,* many-stemmed and *ascending or spreading from a stout caudex,* from cinereous to canescent with dense and fine short pubescence: stems of smaller plants monocephalous: radical leaves spatulate to lanceolate, and cauline lanceolate-oblong to linear, ½ to 2 inches long: heads short-peduncled, 3 or 4 lines high: bracts of the involucre rather unequal: rays 40 or 50, linear, 3 or 4 lines long, *white,* sometimes tinged with rose-color. — From the Saskatchewan to New Mexico and westward.

21. **E. corymbosus,** Nutt. *Taller, often a foot or two high, erect from creeping rootstocks,* soft-cinereous with mostly spreading short pubescence: radical leaves narrow-lanceolate or spatulate-lanceolate, largest 3 or 4 inches long and 3 or 4 lines wide, 3-nerved; cauline linear and narrow: heads sometimes solitary, *usually several and corymbosely disposed* on short slender peduncles: involucre 3 lines high, canescently pubescent: rays 30 to 50, mostly narrow and 3 to 5 lines long, *blue or violet,* apparently sometimes white. — Mountains of Montana to those of Washington Territory and California.

c. *Stems leafy, mostly branched above and bearing few or several heads: pubescence not cinereous nor spreading, either strigose or none: pappus simple.*

22. **E. decumbens,** Nutt. Slender, commonly low or spreading, 6 to 18 inches high, strigulose-pubescent or puberulent, or glabrate: leaves linear or sometimes linear-spatulate (radical not rarely 4 to 6 inches long and only a line or two wide): involucre minutely hirsute or pubescent: rays 15 to 40, white, purplish, or violet-tinged. — Mountains, from Montana and Utah to Oregon and California.

* * * *Perennial by stoloniform creeping rootstocks, or creeping leafy stems or stolons: rays very numerous* (100 *or more*) *and narrow: low ground forms.*

23. **E. Philadelphicus,** L. *Soft hirsute,* a foot or two high, spreading by *rosulate offsets borne on apex of stoloniform creeping rootstocks: stem striate-angled, erect,* corymbosely branching above and bearing several small heads: leaves oblong, or lowest spatulate; *upper cauline half-clasping,* obtuse, *sparingly and coarsely serrate or entire:* peduncles thickened under the head: *rays pink,* almost filiform: *pappus simple.* — Across the continent.

24. **E. flagellaris,** Gray. *More or less cinereous with appressed pubescence:* stems slender, *diffusely decumbent and flagelliform* but leafy, some prostrate, many at length *rooting at the apex and proliferous: leaves small, entire;* radical spatulate and petioled; those of the branches becoming linear: solitary peduncles 2 to 5 inches long: *rays white or purplish: pappus double.* — Pl. Fendl. 69. From the Upper Platte to Colorado, New Mexico, and W. Texas.

* * * * *Mostly cinereous-pubescent or strigose annuals, leafy-stemmed and very branching, often diffusely: heads conspicuously radiate and mostly paniculate: low grounds and plains.*

+– *Akenes narrow, little compressed, with a broad and whitish truncate apex and a simple capillary pappus: rays* 40 *to* 70: *leaves always entire.*

25. **E. Bellidiastrum,** Nutt. Diffusely or loosely branched, a span or two high, cinereous-pubescent: leaves spatulate-linear or the lowest broader, an inch or less long: heads paniculate, short-peduncled: rays light purple. — Nebraska to New Mexico.

+– +– *Akenes compressed,* 2*-nerved: pappus double: inner often fragile or deciduous: rays mostly more numerous: leaves sometimes toothed or lobed.*

26. **E. divergens,** Torr. & Gray. *Diffusely branched and spreading,* a foot or less high, *cinereous-pubescent or hirsute: leaves linear-spatulate* or the upper linear and lowest broader and *sometimes laciniately toothed or lobed:* heads 2 or 3 lines high: rays white or purplish, very numerous: *involucre hirsute:* inner pappus of rather scanty bristles; *outer of short subulate scales.* — Fl. ii. 175. From Nebraska to W. Texas and westward to the coast.

27. **E. strigosus,** Muhl. *Pubescence appressed, often strigose: stem erect,* seldom over 2 feet high, leafy, branched above, bearing cymose or paniculate heads: *leaves lanceolate* and the upper entire; *lower from spatulate-lanceolate to oblong, often serrate:* rays mostly white, not excessively numerous nor very narrow: *involucre with few or no bristly hairs: outer pappus a short crown of distinct or partly united slender scales,* persistent after the fragile inner pappus has fallen. — From Canada to the Saskatchewan and Texas, and westward to Oregon and California.

Var. **Beyrichii,** Gray. A slender form, with minute or even cinereous pubescence, smaller heads, and rays from white to pale rose-color. — Synopt. Fl. i. 219. Within the eastern limits of our range.

§ 2. *Rays inconspicuous or slender, numerous, sometimes not exceeding the disk: within them a series of rayless filiform female flowers* (*commonly none in No.* 29): *leaves entire or nearly so: pappus simple.* — TRIMORPHÆA.

28. **E. acris,** L. *More or less hirsute pubescent,* varying towards glabrous (not glandular): *cauline leaves mostly lanceolate, the lower and radical spatulate: involucre hirsute:* rays slender, equalling or moderately surpassing the disk and pappus, *purple: filiform female flowers numerous.* — In the mountains of Colorado and northward to British Columbia, thence across the continent.

Var. **Dœbachensis,** Blytt. Somewhat glabrous, or even quite so: involucre also green, naked, at most hirsute only at the base, often minutely viscidulous: slender rays somewhat slightly exserted, sometimes minute and filiform and shorter than the pappus. — Same range as the type.

Var. **debilis,** Gray. Sparsely pilose: stems a span to a foot high, slender, 1 to 3-cephalous: leaves bright green; radical obovate or oblong; cauline spatulate to lanceolate, short: involucre sparsely hirsute or upper part glabrate, the attenuate tips of the bracts spreading: rays in flower rather conspicuously surpassing the disk. — Synopt. Fl. i. 220. Mountains of N. Montana, northward and eastward.

29. **E. armeriæfolius,** Turcz. *Sparsely hispid-hirsute* or the leaves glabrous and most of the *narrowly linear and elongated cauline bristly-ciliate:* inflorescence more racemose and strict: *involucre sparsely hirsute:* rays filiform, extremely numerous, slightly surpassing the disk, *whitish, no filiform rayless flowers seen.* — From the mountains of California and Colorado to the Saskatchewan.

§ 3. *Rays of the small* (2 *lines high*) *and narrow seemingly discoid* (*and mostly thyrsoid-paniculate*) *heads inconspicuous, little if at all surpassing the disk or pappus: leaves more or less hispid-ciliate.* — CÆNOTUS, in part.

30. **E. Canadensis,** L. From sparsely hispid to almost glabrous: *stem strict,* 1 *to* 4 *feet high,* with numerous narrowly paniculate heads, or in depauperate plants only a few inches high and with few scattered heads: *leaves linear,* entire, *or the lowest spatulate* and incised or few-toothed: *rays white,* usually a little exserted and *surpassing the style-branches.* — Waste grounds, throughout the continent.

31. **E. divaricatus,** Michx. *Low, a span to a foot high, diffusely much branched,* somewhat fastigiate: *leaves all narrowly linear or subulate, entire: rays purplish, rarely surpassing the style-branches of the pappus.* — Fl. ii. 123. Open grounds from Colorado to the Mississippi Valley.

15. CONYZA, Less.

1. **C. Coulteri,** Gray. A foot or two high, commonly branched, bearing numerous small heads in a mostly crowded thyrsoid leafy panicle, viscidly pubescent or partly hirsute: cauline leaves linear-oblong, the lower spatulate-oblong and with partly clasping base, from dentate to laciniate-pinnatifid, an

inch or two long: involucre 1 or 2 lines high, hirsute with rather soft spreading hairs, considerably shorter than the soft pappus: flowers whitish. — Proc. Am. Acad. vii. 355. W. Texas and Colorado to Arizona and California.

16. BACCHARIS, L.

More or less shrubby: with alternate simple leaves, and the branches striate, bearing small heads of white or yellowish flowers.

1. **B. Wrightii,** Gray. *Herbaceous from a woody base, very smooth and glabrous, a foot or two high;* diffusely branching, sparsely leaved: *slender branches terminated by solitary heads:* leaves *linear,* small; uppermost *linear-subulate:* involucre campanulate, 4 *or* 5 *lines high; its bracts lanceolate, gradually acuminate,* conspicuously scarious-margined, with a green back: *pappus very copious and pluriserial,* soft, elongating in fruit, *fulvous or purplish,* four times the length of the scabrous-glandular 8 to 10-nerved akene. — Pl. Wright. i. 101. W. Texas to S. Colorado and Arizona.

2. **B. salicina,** Torr. & Gray. *Branching shrubs, 3 to 12 feet high,* glabrous or nearly so, *usually viscous, with a resinous exudation:* leaves mostly subsessile, *from oblong to linear-lanceolate,* sparingly toothed, rarely entire: *heads or glomerules pedunculate:* involucre campanulate, about 3 *lines high; its bracts ovate and acutish:* pappus more or less copious, but *mostly uniserial, conspicuously elongating in fruit, white,* soft and flaccid: akenes 10-nerved. — Fl. ii. 258. Colorado to Texas.

3. **B. glutinosa,** Pers. *Stems herbaceous above* but woody toward the base, 3 *to* 10 *feet high:* branches somewhat striate-angled: *leaves elongated-lanceolate, serrate* with few or several scattered teeth on each side, more or less distinctly 3-nerved from near the base, 3 or 4 and the larger 5 or 6 inches long: heads mostly 3 *lines long, numerous and corymbosely cymose* at the summit of comparatively simple stems or branches: *involucre stramineous: pappus not very copious, nor flaccid, and elongated hardly at all in fruit: akene* 5-*nerved.* — From S. California to S. Colorado and Texas.

17. EVAX, Gærtn.

Dwarf and depressed annuals, floccose-woolly. In ours the heads are small and aggregated in terminal foliose-involucrate glomerules.

1. **E. prolifera,** Nutt. Rather stout: stem often a span high, simple and erect, or with ascending branches from the base, bearing numerous small spatulate leaves and a capituliform glomerule, half an inch in diameter; whence proceed 1 to 3 nearly leafless branches similarly terminated, sometimes again proliferous: fructiferous bracts scarious, oval or oblong, mainly naked; those embracing staminate flowers more herbaceous and woolly-tipped, of firmer or more herbaceous texture: staminate flowers each on a filiform stipe representing an abortive ovary. — *Diaperia prolifera,* Nutt. Dry ground, Colorado to Dakota and Texas.

18. ANTENNARIA, Gærtn. Everlasting.

Mostly low, canescently and often floccosely woolly herbs, with whitish or purplish flowers: bracts of the involucre pearly white, rose-color, or brownish, never yellow.

§ 1. *Bristles of the male pappus hardly at all thickened but minutely barbellate near the apex: akenes puberulent: bracts of the involucre brownish.*

1. **A. dimorpha,** Torr. & Gray. Depressed, cespitose from a stout multicipital caudex, bearing rosulate clusters of spatulate leaves: heads solitary and subsessile at the crown, or raised on a sparsely-leaved stem of an inch or less in height: male head 4 lines high, with broad and obtuse involucral bracts; female becoming ½ to ¾ inch long, the inner bracts narrow and long-attenuate into a hyaline acuminate tip: pappus of the fertile flowers of long and fine smooth bristles. — Fl. ii. 431. Dry hills, from Wyoming to California and British Columbia.

§ 2. *Bristles of the male pappus stouter, with thickish and clavate or scarious-dilated tips.*

* *Not surculose-stoloniferous: stems simple from the subterranean branching caudex, leafy, naked at summit, and bearing a cluster of broad heads: inner bracts of the male involucre all with conspicuous ivory-white papery obtuse tips; those of the female with hardly any tips and more scarious: herbage silvery-lanate.*

2 **A. luzuloides,** Torr. & Gray. *Closely silky-woolly:* stems slender, a span to a foot high: leaves all narrowly linear, or some of the lowest narrowly lanceolate-spatulate, small uppermost linear-subulate: *heads small* (2 *lines*, or the female barely 3 lines long), several or numerous: *involucre glabrous nearly or quite to the base;* the inner bracts in the female heads obtuse: *akenes glandular:* the spatulate and as it were petaloid tips of the male pappus obtuse. — Fl. ii. 430. From Wyoming to Oregon and British Columbia.

3. **A. Carpathica,** R. Br. *Floccosely white-woolly,* rather stout: lower leaves spatulate-lanceolate and the upper linear: *heads broad, 3 or 4 lines long: involucre conspicuously woolly at base,* more or less livid, except the white tips to the bracts of the male; the inner bracts of the female commonly acutish and thin-scarious: *akenes smooth and glabrous.* — In the Northern Rocky Mountains, and extending south to Oregon; represented in the lower Rocky Mountains as far south as New Mexico, by the

Var. **pulcherrima,** Hook. Stems 6 to 18 inches high: leaves mostly larger, the radical often half an inch or even almost an inch wide: heads more numerous, often in a compound cyme: bristles of the male pappus with more strongly and abruptly or even scariously dilated tips.

* * *Surculose-proliferous by either subterranean or leafy shoots or stolons.*

+– *Heads in a cymose cluster, sometimes solitary: involucre woolly at base.*

4. **A. alpina,** Gærtn. Somewhat cespitose: *radical shoots few and short:* flowering stems 1 *to* 4 *inches high,* bearing 2 to 5 heads, sometimes a single head: *radical leaves spatulate,* ½ inch long: involucre 3 lines high, *livid-brownish;* the inner of the male heads with *whitish* oblong tips, of the female *wholly livid* and scarious and from acutish to acuminate: akenes glandular. — High mountains of Colorado and California, and far northward.

5. **A. dioica,** Gærtn. *Freely surculose and forming broad mats:* flowering stems 2 *to* 8 *or even* 12 *inches high,* bearing few or numerous heads: *radical leaves from oborate to spatulate,* half-inch to nearly an inch long, rarely glabrate above: bracts of the involucre in both sexes with *colored* (*white or rose-colored*)

and obtuse papery tips: akenes smooth and glabrous or sometimes minutely glandular. — Throughout the mountain region at all elevations and northward, thence eastward across the continent.

Var. **congesta,** DC., has heads sessile in a rosulate tuft of leaves terminating depressed stems, like the sterile creeping ones. — Alpine on Sierra Blanca, S. Colorado, and similar but taller forms from the mountains of Wyoming, etc.

6. **A. plantaginifolia,** Hook. Freely surculose by *long and slender sparsely leafy stolons:* flowering stems more scapiform, 6 *to* 18 *inches high,* bearing small linear or lanceolate leaves and a cluster of several heads: *radical leaves from roundish ovate to obovate and spatulate,* the larger an inch or two long, soon glabrate and green above, silvery-canescent beneath with a completely pannose coating, 3 to 5-nerved: *involucre very woolly at base;* inner bracts of the male heads with oval or oblong obtuse *ivory-white tips,* of the larger (4 to 6 lines long) female heads with *white or whitish* narrow and acute tips: akenes minutely glandular. — From New Mexico to Washington Territory and eastward across the continent.

** *Heads loosely paniculate: involucre almost glabrous.*

7. **A. racemosa,** Hook. Stoloniferous as in the last, lightly woolly, becoming glabrate: flowering stems 6 to 20 inches high, slender, sparsely leafy, bearing few or numerous racemosely or paniculately disposed heads: leaves thin; the radical broadly oval, an inch or two long; lower cauline oblong; upper small and lanceolate: involucre scarious, brownish; the male 2 or 3 lines long, of obtuse bracts, the inner white-tipped; female 3 or 4 lines long, of narrow and mostly acute bracts: akenes glabrous. — From the mountains of Wyoming to the Cascades and the British border.

19. ANAPHALIS, DC. Everlasting.

1. **A. margaritacea,** Benth. & Hook. Commonly a foot or two high, in tufts, very leafy, the white floccose wool rarely becoming tawny: leaves 2 to 5 inches long, from rather broadly to linear-lanceolate, soon glabrate and green above, the broader ones indistinctly 3-nerved: heads numerous, corymbosely cymose: bracts of the involucre very numerous, almost wholly pearly white, radiating in age. — *Antennaria margaritacea,* R. Br. Higher mountains of Colorado and California and far northward; across the continent in its cooler portions.

20. GNAPHALIUM, L. Cudweed. Everlasting.

Floccose woolly herbs: with sessile and sometimes decurrent entire leaves, and cymosely clustered or glomerate heads of whitish or yellowish flowers. Ours belong to the section in which the bristles of the pappus are not united, but fall separately.

* *Involucre woolly only at base, the scarious bracts from white to brownish straw-color: more or less fragrant herbs, erect, a foot or two high: akenes smooth and glabrous.*

1. **G. Sprengelii,** Hook. & Arn. Stems usually stout, 6 to 30 inches high: leaves lanceolate or linear, or the lowest spatulate, *densely white-woolly,*

or sometimes thinly floccose, the *short decurrent bases* or adnate auricles rather broad, *slightly if at all glandular or heavy-scented: heads in single or few close glomerules* terminating the stem or branches: involucre hemispherical, white or yellowish, becoming rusty-tinged. — *G. luteo-album*, var. *Sprengelii*, Eaton. From Texas and Colorado to S. California and N. Oregon.

2. **G. decurrens,** Ives. Stem stout, 2 or 3 feet high, corymbosely branched above and bearing *cymosely crowded glomerules* of broad heads: leaves very numerous, lanceolate or the upper linear, *obviously adnate-decurrent, the upper face becoming naked and green* in age and with the stem *glandular-pubescent or viscid*, white-woolly beneath, *strongly balsamic-scented:* involucre campanulate, white, becoming rusty-tinged. — Am. Jour. Sci. i. 380. From Texas and New Mexico to Washington Territory and British Columbia, and eastward to New England.

* * *Involucre less imbricated, more involved in wool, the scarious tips of the nearly equal bracts inconspicuous and dull-colored: heads glomerate and leafy-bracteate, only a line or so in length: low and branching annuals, a few inches or rarely a foot high: akenes either smooth or scabrous.*

3. **G. palustre,** Nutt. *Loosely floccose with long wool*, erect, at length diffuse or weak: *leaves 3 to 5 lines wide, spatulate* or the uppermost oblong or lanceolate: tips of the linear involucral bracts *white*, obtuse. — In moist grounds from New Mexico to Wyoming and westward.

4. **G. strictum,** Gray. *Appressed-woolly:* stem strict and simple, a span to a foot high, sometimes branching or with ascending stems from the base: *leaves all linear, seldom a line wide: heads in spicately disposed glomerules* in the axils or on short lateral branches: involucral bracts with *brownish or somewhat whitish tips*, obtuse. — Pacif. R. Rep. iv. 110. Rocky Mountain region, from Wyoming to New Mexico and Arizona.

21. MELAMPODIUM, L.

Branching herbs, with opposite mostly sessile leaves, and pedunculate heads terminating the branches or in the forks. In our species the rays are conspicuously exserted and white, and the fructiferous bracts hooded.

1. **M. cinereum,** DC. Branched from the base, a span to a foot high, cinereous or even silvery-canescent with a close pubescence, or greener: leaves linear or the lower lanceolate or spatulate, entire or undulate, or even sinuate-pinnatifid: ligules 5 to 9, cuneate-oblong, 2 to 3-lobed at apex, 3 to 6 lines long: bracts of the involucre ovate, appressed, slightly united at base: fructiferous bracts nearly terete, somewhat incurved, muricate with sharp tubercles; its hood about the length of the body and very much wider, nearly smooth, its truncate and usually even margin commonly incurved. — From S. and E. Colorado to Arizona, Texas, and W. Arkansas.

22. SILPHIUM, L. Rosin-weed.

Tall and coarse perennials: with resinous juice, large leaves, and ample pedunculate heads of yellow flowers. Our species is the "Compass-Plant," with alternate deeply pinnatifid or bipinnatifid leaves, and large heads (sessile or nearly so) racemosely disposed along the naked summit, and very rough herbage.

1. **S. laciniatum,** L. Stem 3 to 6 and even 12 feet high: radical leaves a foot or two long, long-petioled, once or twice pinnately parted or below divided, the divisions and lobes lanceolate to linear; cauline with petiole simply dilated at base, or with stipuliform and sometimes palmatifid appendages; upper sessile and reduced to bracts: involucre inch or more high and broad: rays numerous, inch or two long, bright yellow. — Prairies, from Dakota to Texas and eastward to Wisconsin and Alabama.

23. PARTHENIUM, L.

Ours is an acaulescent cespitose perennial, with the ligule wanting.

1. **P. alpinum,** Torr. & Gray. Densely tufted on a thick branching caudex, depressed, rising only 1 or 2 inches: leaves crowded, silvery-canescent with a fine appressed pubescence, and villous in the axils, spatulate-linear, barely an inch long, entire: heads solitary and nearly sessile among the leaves: pappus a pair of oblong-lanceolate membranaceous scales. — Mountains of Wyoming.

24. PARTHENICE, Gray.

Allied to both *Parthenium* and *Iva*.

1. **P. mollis,** Gray. Annual, with odor of *Artemisia*, 4 to 6 feet high, paniculately branched, minutely cinereous throughout, wholly destitute of any coarser pubescence: leaves all alternate, ovate, some of the larger (10 or 12 inches long) subcordate, acuminate, irregularly or doubly dentate, long-petioled: heads small, 2 lines broad, numerous in loose axillary and terminal somewhat leafy panicles: flowers greenish-white. — S. Colorado to Arizona.

25. IVA, L.

Herbs or shrubs, with entire or serrate leaves, at least the lower ones opposite, and small spicately or racemosely or paniculately disposed or scattered and commonly nodding heads.

* *Heads crowded in narrow spike-like clusters which are aggregated in a naked panicle: leaves long-petioled.*

1. **I. xanthiifolia,** Nutt. Tall and coarse, 3 to 5 feet high, pubescent, at least when young: leaves mainly opposite, broadly ovate, ample, coarsely or incisely serrate, acuminate, 3-ribbed at base, puberulently scabrous above: panicles axillary and terminal: outer involucral bracts 5, broadly ovate and herbaceous; inner of as many membranaceous dilated-obovate or truncate ones, which are strongly concave at maturity and half embrace the obovate-pyriform and glabrate akenes. — From New Mexico to Idaho and the Saskatchewan.

* * *Heads spicately or racemosely disposed in the axils of leaves or foliaceous bracts, and nodding.*

2. **I. ciliata,** Willd. Rather stout, 2 *to* 6 *feet high*, strigose and hispid: leaves nearly all opposite, *ovate, acuminate, sparsely serrate,* the base abruptly contracted into a *hispid petiole: spikes strict,* 3 *to* 8 *inches long;* their bracts lanceolate and ovate-lanceolate, foliaceous, surpassing the at length deflexed heads, hispid-ciliate, as are the 3 or 4 herbaceous and unequal distinct or partly united bracts of the involucre. — From New Mexico to Nebraska and eastward.

3. **I. axillaris,** Pursh. Stems or branches nearly simple, ascending, *a foot or two high: leaves from obovate or oblong to nearly linear, obtuse, entire, sessile,* rarely over an inch long, even the uppermost usually much surpassing the *mostly solitary heads in their axils:* bracts of the involucre connate into a 4 or 5-lobed or sometimes parted, or merely crenate cup. — From New Mexico to Dakota and the Saskatchewan, and westward.

26. OXYTENIA, Nutt.

Shrubby species, with Artemisia-like habit.

1. **O. acerosa,** Nutt. Shrubby, but soft-woody, 3 to 5 feet high, canescent, with erect branches sometimes leafless and rush-like: leaves when present alternate, pinnately 3 to 5-parted into long filiform divisions, or uppermost entire: heads numerous, 2 lines long, in dense panicles. — Dry plains, S. W. Colorado to S. E. California.

27. DICORIA, Torr. & Gray.

1. **D. Brandegei,** Gray. Strigulose-canescent, diffusely and alternately branched leaves of the branches oblong-lanceolate or partly spatulate, obtuse, mostly entire, an inch or less long and with slender petiole: heads sparse, racemose-paniculate; fertile flower solitary; its dilated-cuneate hyaline subtending bract hardly surpassing the outer involucre: akene naked and exserted, bordered with pectinate callous teeth connected by an indistinct scarious margin. — Proc. Am. Acad. xi. 76. Sandy bottoms of the San Juan, near the boundary between Colorado and Utah.

28. AMBROSIA, Tourn. Ragweed.

Coarse herbs, with mostly lobed or dissected opposite and alternate leaves, and dull inconspicuous flowers: sterile heads racemose or spicate and with no bracts: fertile flowers usually glomerate in axils below.

* *Involucre of sterile heads 3-ribbed: no chaff on the receptacle: leaves palmately cleft, ample, petioled.*

1. **A. trifida,** L. Tall and stout, 3 to 12 feet high or more, roughish hispid or almost glabrous: leaves all opposite, very deeply 3-lobed or the lower 5-lobed; the lobes acuminate, serrate: sterile racemes long and dense: fertile heads clustered and as if involucrate by short bracts: fruit very thick, with 5 to 7 strong ribs or angles terminating above in spinous tubercles around the base of the conical beak. — From the plains of Colorado eastward across the continent.

* * *Involucre of sterile heads not ribbed: receptacle with some chaff: leaves mostly 1 to 3-pinnatifid or dissected.*

2. **A. artemisiæfolia,** L. Variously pubescent or hirsute, paniculately branched, *a foot or two high,* or taller: *leaves thinnish, bipinnatifid or pinnately parted with the divisions irregularly pinnatifid* or sometimes nearly entire, on the flowering branches often undivided: sterile heads pedicelled: fruit short-beaked, *armed with 4 to 6 short acute teeth or spines.* — A weed in waste and

cultivated grounds across the continent, known variously as "Roman Wormwood," "Ragweed," and "Bitter-weed."

3. **A. psilostachya,** DC. From slender running rootstocks, *stouter,* 2 *to* 6 *feet high,* with strigose and some loose hirsute pubescence: *leaves thickish; upper simply and lower twice pinnatifid; the lobes mostly lanceolate and acute:* sterile heads commonly short-pedicelled: fruit mostly solitary in the axils below, rugose-reticulated, obtusely short-pointed, *either wholly unarmed or with four short either blunt or acute tubercles.* — From the Saskatchewan to Texas and westward across the continent.

29. FRANSERIA, Cav.

Ours are herbaceous, with chiefly alternate leaves, and the spines of the fruiting and 1 to 2-flowered involucre comparatively few.

* *Fruiting involucre seldom over a line long, in the same plant bearing either* 1 *or* 2 *flowers.*

1. **F. tenuifolia,** Gray. Erect, 1 to 5 feet high, leafy to the top, hispid, variously pubescent, or glabrate: leaves mostly 2 to 3-pinnately parted or dissected into narrowly oblong or linear lobes, the terminal elongated: sterile racemes commonly elongated and paniculate: fertile heads in numerous glomerules below, in fruit minutely glandular, usually 2-flowered, armed with 6 to 18 short and stout incurving spines, their tips almost always hooked, and an excavated cartilaginously bordered areola above each. — Pl. Fendl. 80. From Colorado to California, Texas, and southward.

* * *Fruiting involucre* 3 *or* 4 *lines long at maturity, and longer stout or broad spines: stems low.*

2. **F. Hookeriana,** Nutt. *Diffusely spreading* from an annual root, freely branched, *hirsute-pubescent or hispid:* leaves of ovate or roundish outline, 1 to 3 inches broad, and *bipinnatifid, or the upper oblong and pinnatifid:* sterile racemes solitary or paniculate: fruiting involucre armed with *flat and thin lanceolate-subulate* smooth and glabrous *long and straight spines,* 1-*flowered.* — From the Saskatchewan to Texas and westward across the continent.

3. **F. discolor,** Nutt. A foot or less high, *erect* from perennial slender creeping root-stocks: *leaves canescently tomentose beneath, green and glabrate above, interruptedly-pinnatifid,* oblong in outline, comparatively large, the lowest often 6 inches long; the lobes usually short and broad: sterile racemes commonly solitary: fruiting involucre 2-*flowered, canescent,* armed with rather *short conical-subulate very acute and straight spines.* — Plains, Nebraska to Wyoming, Colorado, and New Mexico.

4. **F. tomentosa,** Gray. A foot high, *rather stout, erect,* from an apparently perennial base, *canescent with a dense sericeous tomentum: leaves very white beneath, cinereous above, pinnately* 3 *to* 5-*cleft or parted;* the terminal division large, oblong or broadly lanceolate, serrate; upper lateral similar but smaller; lowest commonly very small and entire: fruiting involucre 3 lines long, 2-*flowered, nearly glabrous; the short spines conical-subulate,* very acute, and the very *tip usually uncinate-incurved.* — Pl. Fendl. 80. Along streams or river-beds, Kansas and E. Colorado.

30. XANTHIUM, Tourn. Cockle-bur. Clot-bur.

Coarse annuals: with branching stems, alternate and usually lobed or toothed leaves, and mostly clustered heads, both sexes in terminal and larger axillary clusters, the male uppermost; the lower axillary clusters of few or solitary female heads.

1. **X. Canadense,** Mill. Stem often punctate with brown spots: leaves cordate or ovate, 3-ribbed from the base, with dentate margins and often incised or lobed, on long petioles: fruiting involucre about an inch long, densely beset with rather long prickles, the two stout beaks at maturity usually hooked or incurved, the surface and base of the prickles more or less hispid. — *X. strumarium*, var. *Canadense*, Torr. & Gray. From Texas to the Saskatchewan and westward.

31. ZINNIA, L.

With opposite and mostly entire sessile leaves, single heads terminating the branches, and showy flowers. In ours the leaves are narrow and rigid, connate-sessile and crowded, and the akenes 2 to 4-aristate.

1. **Z. grandiflora,** Nutt. Scabrous: stems or branches a span or more high from a stout woody base: leaves linear, 3-nerved at base: involucre narrow, 4 lines long: ligules 4 or 5, at maturity 5 to 8 lines long, dilated-obovate or roundish, light yellow or sulphur-color, becoming white. — Plains and bluffs, E. Colorado to Texas and Arizona.

32. HELIOPSIS, Pers.

With loosely branching stems, veiny and mostly serrate 3-ribbed leaves on naked petioles, and pedunculate showy heads with numerous yellow rays.

1. **H. lævis,** Pers. Smooth and glabrous or nearly so throughout, 3 or 4 feet high: leaves bright green, thinnish, oblong-ovate or ovate-lanceolate from a truncate or slightly cuneate-decurrent base, acuminate, coarsely and sharply serrate with numerous teeth, 3 to 5 inches long: heads somewhat corymbose: rays broadly linear, an inch long: akenes wholly glabrous and smooth. — Near Cañon City, Colorado, *Brandegee;* chiefly a form of the Atlantic States.

33. ECHINACEA, Mœnch.

Perennial herbs, with rather stout erect stems, undivided leaves, the lower long-petioled, and solitary large heads on long peduncles terminating the stem and few branches. Rays from flesh-color to rose-purple, much elongating with age.

1. **E. angustifolia,** DC. Hispid, a foot or two high, mostly simple: leaves from broadly lanceolate to nearly linear, entire, 3-nerved, all attenuate at base, the lower into slender petioles: bracts of the involucre in only about 2 series. — Within the eastern limit of our range and extending eastward.

34. RUDBECKIA, L. Coneflower.

With alternate leaves, either simple or compound, and showy pedunculate heads terminating stem and branches: rays yellow, even sometimes wanting, the disk from fuscous to purplish black.

* *Disk from hemispherical to ovoid, black or dull brown: akenes small, quadrangular, wholly destitute of pappus: leaves undivided: involucre soon reflexed.*

1. **R. hirta,** L. Rather stout, 1 to 3 feet high, rough-hispid and hirsute: leaves from oblong to lanceolate, sparingly serrate or nearly entire, 2 to 5 inches long, the lower narrowed into margined petioles: rays when well developed an inch or two long, golden yellow, sometimes deeper colored toward the base: disk at first nearly black, in age dull brown, becoming ovoid in fruit. — Dry and open ground, from Colorado to the Saskatchewan and eastward across the continent.

* * *Disk from globular to cylindrical, yellowish or brownish: akenes comparatively large, somewhat compressed, with a crown-like pappus: involucre loose and foliaceous but not usually reflexed.*

+ *Rays few or several, inch or two long, drooping, pure yellow: disk dull yellowish; the tip of the chaffy bracts canescent: pappus a short 4-toothed or nearly entire crown: nearly all the leaves cleft or divided: stems branching.*

2. **R. laciniata,** L. Glabrous and smooth, sometimes minutely scabrous, at least on the margins and upper face of the leaves: stem 2 to 7 feet high, branching above: leaves veiny, broad, incisely and sparsely serrate; radical commonly pinnately 5 to 7-foliolate or nearly so, and divisions often laciniately 2 to 3-cleft; lower cauline 3 to 5-parted, upper 3-cleft, and those of the branches few-toothed or entire. — Moist ground, from Montana to Arizona and New Mexico, and eastward across the continent.

+ + *Rays wanting: disk brownish; the tip of the chaffy bracts puberulent: receptacle bodkin-shaped: scarious cup-shaped pappus very conspicuous: stems stout, simple.*

3. **R. occidentalis,** Nutt. Nearly glabrous and smooth, or somewhat scabrous-puberulent: *leaves undivided,* ovate or ovate-lanceolate, acuminate, *entire, or irregularly and sparingly dentate, 4 to 8 inches long;* upper sessile by a rounded or subcordate base; lower abruptly contracted into a short winged petiole, rarely a pair of obscure lateral lobes: disk in age becoming 1½ inch long, and akenes 2 lines long. — Trans. Am. Phil. Soc. vii. 355. Mountains of Wyoming to Idaho and Oregon.

4. **R. montana,** Gray. Smoother, somewhat glaucous, tall and very stout: *leaves 8 to 12 inches long, pinnately parted into 3 to 9 oblong-lanceolate divisions,* or the lanceolate uppermost cauline with 2 to 4 narrow lateral lobes: disk cylindraceous or cylindrical, *at length often 3 inches long* and an inch in diameter; akenes with the deep coroniform pappus 3 *or 4 lines long.* — Proc. Am. Acad. xvii. 217. Mountains of Colorado.

35. LEPACHYS, Raf.

Herbs, with pinnately parted leaves, and terminal long-peduncled showy heads, the drooping rays yellow or partly brown-purple: truncate inflexed tips of the chaff pubescent: disk yellowish, becoming darker.

1. **L. columnaris,** Torr. & Gray. Scabrous, 1 or 2 feet high, branching from the base: divisions of the cauline leaves 5 to 9, from oblong to narrowly linear, sometimes 2 to 3-cleft: rays commonly an inch or more long, normally

all yellow: disk at length columnar, an inch or more long. — Plains, from the Rocky Mountains to the Saskatchewan and Texas.

Var. **pulcherrima,** Torr. & Gray. A part or even the whole upper face of the ray brown-purple. — From Arizona to Texas and Nebraska.

36. BALSAMORRHIZA, Hook.

Low; with thick, deep and balsamic roots; a tuft of radical leaves mostly on long petioles; and short simple few-leaved flowering stems or naked scapes, bearing large and mostly solitary heads of yellow flowers.

* *Leaves entire or nearly so; the principal ones cordate or with cordate base and long-petioled.*

1. **B. sagittata,** Nutt. Silvery-canescent, and the involucre white-woolly: radical leaves from cordate-oblong to hastate, 4 to 9 inches long, the base 2 to 6 inches wide, on petioles of greater length; the few and inconspicuous cauline from linear to spatulate: scape at length a foot or more high: rays 1 to 2 inches long. — Mountains of Colorado to Montana and British Columbia. Used for food by the Indians.

* * *Leaves neither entire nor cordate, varying from laciniately dentate to bipinnately divided: heads solitary on a naked scape or one bearing a pair of small opposite leaves towards the base.*

2. **B. macrophylla,** Nutt. *Green, not at all canescent,* glabrate, except the ciliate margins of the leaves, usually minutely glandular-viscidulous: leaves ample, *ovate or oblong in outline,* a span to a foot long, *some with only one or two lobes* or coarse teeth, most of them *pinnately parted into broadly lanceolate* and commonly entire *lobes:* scapes a foot or two high: bracts of the involucre from narrowly lanceolate to spatulate and foliaceous, an inch or two long, nearly equal, either half or fully the length of the rays. — Trans. Am. Phil. Soc. vii. 350. Rocky and Wahsatch Mountains, Wyoming to Utah.

3. **B. Hookeri,** Nutt. *Canescent with fine sericeous or more tomentose pubescence,* but not at all hirsute: scapes and leaves a span to a foot high; the latter *lanceolate or elongated-oblong in outline, pinnately or bipinnately parted into lanceolate or linear divisions or lobes,* or some of them only pinnatifid or incised: involucre from canescently puberulent to lanate; its bracts from linear- to oblong-lanceolate, either unequal and well imbricated or sometimes the outermost foliaceous and enlarged. — Torr. & Gray, Fl. ii. 301. West of our range, but represented by

Var. **incana,** Gray. *Densely white-tomentose:* leaves often of broader outline. — Synopt. Fl. i. 266. *B. incana,* Nutt. Wyoming and Montana to N. California.

37. WYETHIA, Nutt.

Stout and mostly low; with ample undivided pinnately veined alternate leaves (mostly entire), and large heads of mostly yellow flowers.

* *Rays from pale yellow or dull straw-color to white.*

1. **W. helianthoides,** Nutt. A span to a foot and a half high, simple and with a single large head, or rarely 3 or 4, hirsute: leaves from oval to

broadly lanceolate, denticulate or entire, 4 to 8 inches long, mostly narrowed at base into a short margined petiole: heads an inch high: bracts of the involucre narrowly lanceolate, numerous: rays nearly 2 inches long: akenes 4 lines long, either prismatic-quadrangular or flattish, 12-nerved: pappus sometimes minute, chaffy coroniform and cleft into few or several teeth. — Northern Rocky Mountains, in moist valleys, S. W. Montana to E. Oregon.

* * *Rays bright yellow.*

+ *Glabrous and smooth throughout, usually balsamic-viscid: leaves lanceolate to oblong.*

2. **W. amplexicaulis,** Nutt. A foot or two high, robust: leaves mostly lanceolate-oblong, entire or denticulate; radical often a foot or more long; upper cauline partly clasping by a rounded or somewhat narrowed base: heads solitary or several, short-peduncled: involucral bracts broadly lanceolate, one or two outer ones occasionally foliaceous and larger: rays 1½ inches long: akenes with a conspicuous crown cleft into acute teeth, and sometimes a small awn. — From Colorado to Montana and British Columbia. Called "Pe-ik" by the Indians.

+ + *Hirsutely pubescent or scabrous: leaves elongated-lanceolate or linear.*

3. **W. Arizonica,** Gray. *Hirsutely pubescent,* a foot high, bearing a single or few heads: *leaves oblong-lanceolate,* tapering to both ends, or the upper and sessile cauline broader: involucre of rather foliaceous and *erect bracts:* rays 8 to 12: pappus a *very narrow crown,* extended into 3 or 4 stout subulate teeth, or into 1 or 2 short awns. — Proc. Am. Acad. viii. 655. S. Colorado to S. Utah and Arizona.

4. **W. scabra,** Hook. *Very scabrous,* a foot or two high, rigid: cauline *leaves linear,* thick, 4 to 6 inches long, ½ inch wide, sessile, attenuate-acute: involucral bracts imbricated in 3 or 4 series, all the outer with an appressed base, which is *acuminate into a longer subulate filiform spreading very hispid-scabrous appendage:* rays several, ½ inch long: akenes acutely angled, the 3 or 4 angles extended into a pappus of as many short blunt teeth, which are *barely confluent* at base. — New Mexico and S. Colorado to Utah and Wyoming.

38. GYMNOLOMIA, HBK.

With erect branching stems, alternate or opposite leaves, and heads of yellow flowers; resembling small-flowered species of *Helianthus.*

1. **G. multiflora,** Benth. & Hook. A foot to a yard high, pubescent or scabrous, sometimes also hispid, often much branched: leaves from narrowly linear to lanceolate, either alternate or mainly opposite, entire or obscurely denticulate: rays 10 to 15, golden yellow: disk hemispherical, in age little more elevated and receptacle obtusely conical; its bracts linear, obtuse or the inner acute: akenes smooth. — *Heliomeris multiflora,* Nutt. Very polymorphous. From Arizona to Wyoming and W. Texas.

39. HELIANTHUS, L. Sunflower.

Usually tall or coarse; with a part or all the leaves opposite and simple; heads peduncled and terminating the stems or branches, with yellow rays, and either yellow or purple disk-flowers.

§ 1. *Annuals: receptacle flat or nearly so: all but the lower leaves usually alternate, petioled, 3-ribbed: involucre spreading; its bracts attenuate: disk brownish or dark purple.*

1. **H. annuus,** L. *Robust,* when well developed tall, *hispid,* hispidulous, *or scabrous:* stem often spotted or mottled: *leaves ovate and the lower cordate, serrate, the larger 6 to 12 inches long,* the blade of the cauline ones longer than their petiole: bracts of the involucre from broadly ovate to oblong, aristiform-acuminate, *below hispidly ciliate:* disk in the wild plant commonly an inch or more in diameter. — Includes *H. lenticularis,* Dougl., and many other forms. From the Saskatchewan to Texas and westward. The "Common Sunflower," extensively cultivated everywhere and thus becoming very tall and with enormous heads. Fruit used by the Indians for food and oil.

2. **H. petiolaris,** Nutt. A foot to a yard high, *more slender,* loosely branching, *strigose-hispidulous,* rarely hirsute: *leaves oblong-lanceolate or ovate-lanceolate, entire or sparingly denticulate, 1 to 3 inches long,* cuneately attenuate or the lower abruptly contracted into a *long and slender petiole:* bracts of the involucre lanceolate or oblong-lanceolate, with acute and mucronate or sometimes more attenuate tips, *seldom at all ciliate:* disk ½ inch or more in diameter. — About the same range as the last.

§ 2. *Perennials: receptacle convex, or at length low-conical: lower leaves almost always opposite.*

* *Involucre loose, becoming more or less squarrose; its bracts almost equal, filiform-attenuate: disk usually dark purple or turning brownish: all but the lower leaves long-linear or filiform.*

3. **H. orgyalis,** DC. Stem smooth and glabrous, often 10 feet high, very leafy to the top: leaves mostly alternate, from long-linear, 8 to 16 inches long, commonly 2 to 4 lines wide, or the lowest lanceolate, to almost filiform, slightly papillose-scabrous, the lower narrowed into a petiole and sometimes serrulate: bracts of the involucre filiform-attenuate, those of the receptacle entire: akenes oblong-obovate with a rounded summit, 3 lines long. — Dry plains, Nebraska to Texas, west to S. E. Colorado.

* * *Involucre closer, of more imbricated and unequal ovate or oblong but not foliaceous bracts: leaves from lanceolate to ovate: herbage not tomentose nor conspicuously cinereous.*

4. **H. rigidus,** Desf. A foot or two (rarely 6 to 8 feet) high, rigid, sparingly branched: *leaves very firm-coriaceous and thick, both sides hispidulous-scabrous, shagreen-like,* entire or serrate; lower oblong and ovate-lanceolate, attenuate at base into short winged petioles; upper mostly lanceolate: *heads comparatively large, showy;* disk ¾ inch high, *dark purple or brownish: involucre pluriserially imbricated;* its bracts mainly ovate, obtuse or acutish, rigid, appressed, *densely and minutely ciliate.* — Plains and prairies from Michigan to Texas and west to E. Colorado.

5. **H. pumilus,** Nutt. Hispid and scabrous throughout: *stems simple,* a foot or two high, *bearing 5 to 7 pairs of leaves* and a few rather short-peduncled heads: leaves mostly ovate-lanceolate, acute, entire or nearly so, 1½ to 4 inches long, rigid, abruptly contracted at base into a short margined petiole: *involucre less than half-inch high, white hirsute* or scabro-hispidulous; its bracts

imbricated in about 3 *series*, oblong-lanceolate, acutish: *disk yellow.* — Eastern Rocky Mountains and adjacent plains, from Wyoming to Colorado.

* * * *Involucre looser and the bracts disposed to be more taper-pointed, or foliaceous: disk yellow or yellowish.*

+– *Stems smooth or somewhat scabrous: leaves mostly lanceolate or narrower: involucral bracts linear-subulate, loose or soon squarrose-spreading.*

6. **H. grosse-serratus,** Martens. *Stem very smooth and glabrous, commonly glaucous*, 6 to 10 feet high, bearing numerous rather cymosely disposed and short-peduncled heads: *leaves slender-petioled*, thinnish, oblong lanceolate or narrower, or some of the cauline almost deltoid-lanceolate, gradually acuminate, *sharply serrate*, or upper merely denticulate, slightly scabrous above, *whitish and soft-puberulent beneath*; larger cauline commonly 8 to 10 inches and the petiole an inch or two long: deep yellow oblong rays over an inch long. — Dry plains, from Texas to Dakota and as far east as Ohio.

7. **H. Maximiliani,** Schrader. *Hispidulous-scabrous: stem stout*, 2 or 3 (and even 10 to 12) feet high, *below mostly rough-hispid: leaves almost all alternate, thickish, becoming rigid, very scabrous above*, lanceolate, acute or acuminate at both ends, *mostly subsessile, all entire or sparingly denticulate:* involucre of more rigid bracts: rays numerous, often inch and a half long, golden yellow. — Prairies and plains west of the Mississippi, and from the Saskatchewan to Texas.

8. **H. Nuttallii,** Torr. & Gray. *Stem slender*, 2 to 4 feet high, commonly simple, *smooth and glabrous:* leaves lanceolate or the upper linear, 3 to 6 inches long, 3 to 9 lines wide, *short-petioled or subsessile, serrulate or entire:* bracts of the involucre naked or somewhat hirsute at base: paleæ of the pappus long and narrow. — Fl. ii. 324. In wet soil, W. Wyoming and Utah to Oregon, Washington Territory, and British Columbia.

+– +– *Stems pubescent or hirsute: leaves ovate or subcordate: involucral bracts lanceolate, loose, hirsute-ciliate.*

9. **H. tuberosus,** L. Stem 5 to 10 feet high, branching at summit: leaves mostly alternate on the branches, acuminate, dull green, minutely pubescent and occasionally cinereous beneath, soon scabrous above: bracts of the involucre attenuate-acuminate: rays often inch and a half long, 12 to 20: bracts of the receptacle hirsute-pubescent on the back: akenes more or less pubescent at summit and margins, mostly long and slender. — The "Jerusalem Artichoke," widely cultivated for its fleshy tubers, and found under various forms, especially in the E. United States. An indigenous form coming within our range is

Var. **subcanescens,** Gray. Mostly dwarf, about 2 feet high, comparatively small-leaved, rough-hispidulous or scabrous, but the lower face of the leaves whitish with soft and fine pubescence. — Synopt. Fl. i. 280. Plains of Minnesota, Dakota, etc.

40. HELIANTHELLA, Torr. & Gray.

Leafy-stemmed: leaves lanceolate to ovate, with tapering base, opposite or alternate: rays broad, yellow: disk yellow or purplish-brown: akenes flat, from cuneate-obovate and emarginate to slightly obcordate.

* *Chaffy bracts of the receptacle soft and scarious: akenes with some long villous hairs on the margins and sometimes on the faces.*

+– *Heads showy, large or middle-sized, solitary, or some later ones axillary: bracts of the involucre loose and lanceolate-attenuate or linear, more or less foliaceous, conspicuously hirsute-ciliate: disk yellowish.*

1. **H. quinquenervis,** Gray. Somewhat hirsutely pubescent or almost glabrous: *stems solitary or scattered,* 2 to 4 feet high: *leaves mostly opposite, oblong- or ovate-lanceolate,* acuminate, 4 *to* 9 *inches long,* uppermost sessile, lower ones tapering into margined petioles, and the lowest (*a foot or more long*) into longer petioles: head mostly long-peduncled, ample, *the disk a full inch in diameter:* rays 15 to 20, pale yellow, commonly inch and a half long: *pappus of* 2 *slender awns, of half the length of the akene, and nearly thrice the length of the squamellæ,* which form a conspicuous finely dissected fringe. — Proc. Am. Acad. xix. 10. *H. uniflora* of the Fl. Colorado and Bot. King's Exp. Mountains from Dakota and Montana to S. Colorado.

2. **H. Parryi,** Gray. Hispidulous-hirsute: *stems numerous from a thickened root,* a foot high, rather slender: *leaves mostly alternate,* more rigid, *lanceolate and an inch or two long,* or the lowest and radical *oblong-spatulate* and of double the size: *heads and rays barely half the size of the preceding: pappus of fimbriately dissected squamellæ only,* or with a pair of slender awns not surpassing these. — Proc. Acad. Philad. 1863, 68. Mountains of Colorado and New Mexico.

+– +– *Heads small: involucre more imbricated: rays few and hardly surpassing the dark purple disk.*

3. **H. microcephala,** Gray. Hispidulous-scabrous: stems numerous from a greatly thickened root, a foot or less high, slender, somewhat paniculately or corymbosely branched at summit and bearing several heads: leaves rigid, all but the lower alternate; radical lanceolate-spatulate; upper cauline nearly linear and sessile, an inch long: involucral bracts linear-oblong, mostly obtuse: rays not over 3 lines long: pappus of several slender squamellæ intermixed with the long hairs, two marginal ones often extended and awn-like. — Proc. Am. Acad. xix. 10. Borders of Colorado and adjacent New Mexico and Utah.

* * *Chaffy bracts of the receptacle firm-chartaceous: stems a foot or two high.*

4. **H. uniflora,** Torr. & Gray. Minutely pubescent or glabrate: leaves more commonly opposite, sometimes all alternate, oblong-lanceolate, 2 to 5 inches long; lower short-petioled: involucre pubescent or slightly hirsute: rays a full inch long: akenes more or less ciliate: pappus a pair of long awns and rather conspicuous squamellæ. — Gray, Proc. Am. Acad. xix. 10. *H. multicaulis* of Bot. King's Exp. Mountains of Montana and E. Idaho to S. Utah.

41. VERBESINA, L.

Flowers yellow or rarely white. Ours belongs to § *Ximenesia,* in which the heads are broad, the involucre of spreading linear and foliaceous equal bracts, and the disk and receptacle merely convex: the rays are numerous and conspicuous.

1. **V. encelioides,** Benth. & Hook. A foot or two high, freely branching, pale and cinereous or sometimes canescent: leaves mostly alternate, and the upper face green, from ovate or cordate to deltoid-lanceolate, variously serrate or laciniate-dentate, most with winged petioles, and commonly with auriculate-dilated appendage at base: disk three fourths inch in diameter: rays 12 to 15, an inch long, deeply 3-cleft at summit: akenes obovate, mostly broadly winged and with short awns. — *Ximenesia encelioides,* Cav. From S. Colorado and Arizona to Texas.

42. COREOPSIS, L. Tickseed.

Pedunculate heads terminating the branches: rays mostly showy, yellow, party-colored, or rose-colored. In ours the akene is wingless.

1. **C. tinctoria,** Nutt. Glabrous, 2 or 3 feet high: leaves opposite and all 1 to 2-pinnately divided into *lanceolate or linear divisions: outer involucre short and close:* rays ½ to ¾ inch long, *either yellow with crimson-brown base or nearly all crimson brown: disk-flowers dark purple or brown: akenes moderately incurved: pappus none* or an obscure border. — From Colorado and Arizona to the Saskatchewan and Texas.

2. **C. involucrata,** Nutt. Somewhat pubescent or glabrous, 1 to 3 feet high: leaves opposite and all pinnately 3 to 7-divided or parted; the *divisions serrate, incised, or again cleft:* bracts of the outer involucre 12 to 20, *mostly surpassing the inner,* slender, hispid on the back and margins: rays sometimes an inch long, *golden yellow: disk-flowers dull yellow: akenes straight, with 2 short acute teeth.* — Plains of E. Colorado to Texas and W. Illinois.

43. BIDENS, Tourn. Bur-Marigold.

Leaves opposite, simple or compound: heads of mostly yellow flowers solitary or paniculate.

§ 1. *Akenes flat, from obovate to cuneiform, not at all contracted at summit,* 2 *to* 4-*awned: outer involucre foliaceous and spreading.*

* *Heads erect, rayless, or rarely with* 1 *to* 5 *small rays: disk greenish yellow: leaves mostly petioled and divided.*

1. **B. frondosa,** L. Glabrous or somewhat hairy, branching, 2 to 6 feet high: leaves except the uppermost pinnately 3 to 5-divided into lanceolate or broader sharply serrate petiolulate leaflets: outer involucre often very leafy: akenes obovate or oblong, more or less hairy, 2-awned. — Shady or moist rich ground, common everywhere. The common "Stick-tight."

* * *Heads commonly with conspicuous rays: leaves all sessile and undivided; upper pairs somewhat connate round the stem: margins of the cuneate akenes and the rigid awns retrorsely hispid.*

2. **B. cernua,** L. Stem glabrous or setulose-hispid, from a span to a yard high: leaves oblong-lanceolate, *coarsely and irregularly sharply serrate: heads conspicuously nodding after anthesis,* commonly surpassed by the foliaceous outer involucre: rays ovate or oval, *little surpassing the disk or wanting:* akenes usually 4-awned. — Across the continent, especially in the more northern latitudes. In wet grounds.

3. **B. chrysanthemoides,** Michx. Glabrous, often decumbent at base, a foot or two high: leaves lanceolate, *rather minutely and evenly serrate:* heads rather large, *little or not at all nodding:* outer involucre seldom surpassing the inner, *conspicuously surpassed by the* oval or broadly oblong *rays:* akenes 2 to 4-awned. — Wet grounds, across the continent; on the plains around Denver.

§ 2. *Akenes narrow, linear-tetragonal; the outer shorter and more truncate than the inner, which generally taper upward: outer involucre seldom foliaceous or enlarged: leaves (in ours) all once to thrice* 3 *to* 5-*nately parted or divided, and the rays inconspicuous or none.*

4. **B. bipinnata,** L. Primary and secondary divisions of the leaves rather *ovate or deltoid-lanceolate in circumscription,* and the lobes mostly acute: *akenes all slender, the inner ones* 5 *to* 9 *lines long,* outermost moderately shorter and thicker: *awns* 3 *or* 4, sometimes only 2. — A common weed in waste ground throughout the continent. Commonly known as "Spanish Needles."

5. **B. tenuisecta,** Gray. A foot or two high, branched from the base, sparsely hirsute or glabrous: leaves 2 to 3-ternately or pinnately dissected into *narrow linear lobes:* heads on naked rather long and stout peduncles, many-flowered, 4 or 5 lines high in flower: akenes glabrous, 2-*awned; inner* 5 *lines long,* with tapering summit; outermost 3 lines long, stouter and *with broad summit* and usually short awns: rays yellow, mostly surpassing the disk. — Pl. Fendl. 86. Along water-courses, Colorado, New Mexico, and Arizona.

44. THELESPERMA, Less.

Smooth and glabrous perennials: with opposite usually finely dissected leaves, and pedunculate heads: the rays golden yellow.

* *Lobes of the disk-corollas linear or lanceolate, longer than the throat: pappus evident: chaff of receptacle falling with and partly embracing the akenes.*

1. **T. ambiguum,** Gray. A foot high, *spreading by creeping rootstocks,* rather rigid and naked above: leaves bipinnately divided into narrowly linear or filiform lobes: *bracts of the outer involucre* 8, *subulate-linear, almost equalling or half the length of the inner,* which are connate to or above the middle: *rays broad, over* ½ *inch long,* rarely wanting: *disk usually purple* turning brownish: outer akenes becoming coarsely papillose; *the stout pappus-scales not longer than the width of the akene.* — Proc. Am. Acad. xix. 16. *T. filifolium* of most of the Western Reports. From Montana to Colorado, New Mexico, and W. Texas.

2. **T. gracile,** Gray. More rigid, a foot or two high, *from a deep root,* less branched, naked above: leaves once or twice 3 to 5-nately divided or parted into filiform-linear or broader lobes, or some upper ones filiform and entire: *bracts of the outer involucre* 4 *to* 6, *very short, ovate or oblong;* of the inner one connate to above the middle, the edges of their lobes slightly scarious: *disk mostly yellow,* scarcely brownish after anthesis: akenes less papillose or roughened, *the breadth of the summit exceeded by the subulate awns: rays usually none,* rarely present and 2 or 3 lines long, — Loc. cit. Plains, Nebraska and Wyoming to W. Texas and Arizona.

* * *Lobes of disk-corollas ovate or oblong, decidedly shorter than the throat: pappus shorter and coroniform or obsolete: very leafy below, sending up long and naked peduncles: outer involucre short.*

3. **T. subnudum,** Gray. Rather stout: leaves thickish and rigid, once or twice ternately parted into linear or lanceolate lobes: peduncles 4 to 10 inches long: head ½ inch high: rays sometimes none, sometimes ample: pappus a minute 4 to 5-toothed naked crown, or obsolete. — Proc. Am. Acad. x. 72. Green River, Wyoming, *Parry;* mainly in New Mexico, N. Arizona, and S. Utah.

45. MADIA, Molina. Tarweed.

Glandular and viscid herbs, mostly heavy-scented: with entire or merely toothed leaves, some or all of them alternate: heads axillary and terminal. Ours belongs to the § *Eumadia*, in which the rays are few and inconspicuous or none and the pappus none.

1. **M. glomerata,** Hook. A foot or so high, rigid, very leafy, hirsute, glandular only toward the inflorescence: leaves narrowly linear: heads glomerate: rays 2 to 5 or sometimes none, not surpassing the about equal number of disk-flowers: akenes narrow, those of the disk 4 to 5-angled; of the ray somewhat curved and 1-nerved on each face. — Mountains of Colorado, to the Saskatchewan, the Sierras of California, Oregon, and Washington Territory.

46. LAYIA, Hook. & Arn.

Branches terminated by showy heads of (in ours) white flowers: pappus of 10 to 20 stout bristles, which are plumose below the middle: herbage hispid or hirsute, somewhat viscid, above beset with scattered stipitate blackish glands.

1. **L. glandulosa,** Hook. & Arn. A span to a foot or more high, diffusely branched: lower leaves lanceolate or linear, laciniate-pinnatifid or incised, upper narrow and entire: rays 8 to 13, large and conspicuous (bright white or tinged with rose), ½ to ¾ inch long, 3-lobed: villous hairs of the pappus bristles copious, the outer straight and erect, the inner soon crisped and interlaced into a woolly mass. — Barren ground, from New Mexico through S. W. Colorado to Idaho, and westward.

47. RIDDELLIA, Nutt.

Low and corymbosely branched woolly herbs: with alternate and spatulate or linear leaves, the cauline entire: small heads of yellow flowers: bracts of the involucre distinct, but connected by the intricate wool so as to seem connate.

1. **R. tagetina,** Nutt. Loosely or somewhat villosely lanate, sometimes glabrate in age, rather widely branched: radical and even lower cauline leaves often laciniate-pinnatifid: heads numerous, mostly cymosely clustered and short-peduncled: scales of the pappus oblong-lanceolate, entire, usually obtuse, ½ or ¾ the length of the disk-corolla. — W. Texas to E. Colorado and Arizona.

48. PERICOME, Gray.

The name refers to the coma of long hairs all round the margin of the akenes.

1. **P. caudata,** Gray. Rather tall, widely branching, strong-scented, very minutely puberulent: leaves opposite, long-petioled, green and minutely somewhat resinous-atomiferous, triangular-hastate, 2 to 5 inches long, with sparingly crenate-dentate or entire margins, caudately long-acuminate, as also in less degree are the basal angles: heads numerous in terminal corymbiform cymes, half-inch or less high; flowers golden yellow, conspicuously longer than the glabrous involucre: pappus a crown of hyaline scales which are more or less connate and fimbriate-lacerate at summit, the fringe dissected into bristles or hairs somewhat simulating those of the margin of the akene. — Pl. Wright. ii. 82. Rocky cañons, etc., S. Colorado, New Mexico, and Arizona.

49. ERIOPHYLLUM, Lag.

Mostly floccose herbs: with alternate or partly opposite leaves, and pedunculed heads: flowers golden yellow. In ours the heads are mostly solitary or scattered and conspicuously pedunculate.

1. **E. cæspitosum,** Dougl. Floccosely white-woolly, many-stemmed from the root: leaves in age with upper face often glabrate; lower ones from spatulate or cuneate to roundish in outline, from incisely 3 to 5-lobed to pinnately parted, or the upper varying to linear and entire: involucral bracts 8 to 12, oblong or oval: tube of disk-corollas mostly hirsute-glandular and longer than the pappus, which is variable, sometimes very short, sometimes obsolete. — *Bahia lanata,* DC. Common from Montana to British Columbia and thence southward. Very variable, one form within our range being

Var. **integrifolium,** Gray. Low, often dwarf, cespitose-tufted, 3 to 10 inches high: leaves from narrowly spatulate or oblanceolate and entire to more dilated and 3-lobed at summit, or at base and on sterile shoots cuneate and incisely lobed: involucre of 6 bracts: pappus about equalling the very glandular but not hirsute corolla-tube. — Proc. Am. Acad. xix. 25. *Bahia integrifolia,* DC. Mountains of Wyoming, Montana, and westward.

50. BAHIA, Lag.

Sometimes canescent but not woolly: with opposite or sometimes alternate leaves, and rather small pedunculate heads of yellow flowers terminating the branches.

* *Scales of the pappus 4 to 8, obovate or spatulate, with rounded or truncate scarious summit: leaves dissected or cleft, mostly opposite.*

1. **B. oppositifolia,** Nutt. A span or two high, fastigiately branched and many-stemmed, very leafy up to the short-peduncled heads, cinereous with fine close pubescence: leaves petioled, palmately or pedately 3 to 5-parted into linear divisions little broader than the margined petiole: bracts of the involucre oblong or oval, comparatively close: rays 5 or 6, oval, hardly surpassing the disk-flowers: akenes slender, glandular: pappus half the length of the corolla-tube. — Sterile hills and plains, Nebraska to Colorado and New Mexico.

* * *Scales of the pappus about* 10, *linear-lanceolate, and with a distinct rib: leaves all alternate and entire.*

2. **B. nudicaulis,** Gray. Cinereous-puberulent and glabrate, upper part of the scapiform stem and involucre minutely glandular, a span or two high: *leaves nearly all radical,* oval or spatulate-oblong, tapering into a slender petiole: heads solitary or few and somewhat corymbosely paniculate, *nearly* ½ *inch high:* involucre of about 10 oblong bracts: rays 6 to 9, oblong: *pappus fully half the length of the* cuneate-linear *sparsely hairy akene;* the thin margins of the paleæ of the pappus *erose.* — Proc. Am. Acad. xix. 27. Wind River Mountains, N. W. Wyoming, *Parry.*

3. **B. oblongifolia,** Gray. Smaller: *stems sparsely leafy almost to the* 3-*cephalous naked inflorescence: leaves narrowly oblong: head only* 4 *lines high,* narrow: paleæ of the pappus firmer, smoother, and *with entire edges, little shorter than the glabrate akene* — Loc. cit. On the San Juan and Rio Colorado, S. E. Utah or adjacent Colorado.

* * * *Leaves once or twice palmately or pedately divided: akenes mostly hirsute along the slender attenuate base.*

+ *Leaves mainly opposite: rays none: pappus of broad and very obtuse scales.*

4. **B. Neo-Mexicana,** Gray. A span or more high, minutely puberulent: leaves 3 to 7-parted into narrow linear divisions; uppermost little shorter than the slender peduncles: involucre of about 10 sparingly pubescent spatulate bracts: disk-corollas small, with glandular tube, almost equalled by the obovate scales of the pappus, which are much thickened at and near the base. — Proc. Am. Acad. xix. 27. New Mexico and S. Colorado.

+ + *Leaves mainly alternate: rays* 16 *to* 20, *obovate-oblong, yellow: pappus none.*

5. **B. chrysanthemoides,** Gray. Taller and stouter, 1 to 4 feet high, puberulent or below glabrous, above with the flowering branches and short peduncles glandular-pubescent and viscid: leaves 1 to 3-ternately divided or parted; the lobes from oblong and obtuse to nearly linear: heads 5 or 6 lines high and broad: bracts of the involucre 16 to 20, crowded, from oblong-lanceolate to obovate-oblong, most of them conspicuously acuminate. — Proc. Am Acad. xix. 28. *Villanova chrysanthemoides,* Gray. Along mountain-water-courses, Colorado to S. Arizona.

51. HYMENOPAPPUS, L'Her.

Mostly floccose-tomentose and with sulcate-angled erect stems, alternate mostly 1 to 2-pinnatifid or parted leaves, and cymose or solitary pedunculate heads of white or yellow flowers.

* *Flowers white; the tube long and slender and stamens much exserted: pappus of very small scales forming a crown, or obsolete: akenes puberulent: involucre of partly white-petaloid bracts.*

1. **H. corymbosus,** Torr. & Gray. Slender and glabrate, naked above: lower leaves 2-pinnately and the small upper ones mostly simply parted into narrowly linear acute divisions and lobes: heads 3 or 4 lines high: bracts of the involucre shorter than the flowers, obovate-oblong, the petaloid summit

only greenish white: akenes puberulent. — Fl. ii. 372. Prairies, Nebraska to Arkansas and Texas, extending westward to within the eastern limits of our range.

* * *Flowers dull white to yellow: pappus conspicuous, of spatulate or narrow scales which have a manifest rib: akenes villous: involucre greener, less petaloid.*

2. **H. tenuifolius,** Pursh. *Lightly tomentose,* or soon glabrate and green, *leafy:* leaves rather rigid, once or twice pinnately parted into very narrowly linear or filiform divisions, their margins soon revolute: heads only 3 or 4 lines high, *numerous and cymose:* involucre rather erect and close; its bracts oblong-obovate, *greenish with whitish apex and margins: corolla dull white:* akenes long-villous. — Fl. ii. 742. Plains, from Nebraska to Arkansas, Texas, and Utah.

3. **H. filifolius,** Hook. *Tomentose-canescent,* or somewhat denudate and glabrate, *naked above:* stems a span to a foot high, sometimes scapiform: leaves nearly as in the last, or of *more filiform rigid divisions:* heads a third to half inch high, *few or solitary:* bracts of the involucre oblong or obovate-oblong, largely *green or else white-woolly, the tips whitish or purplish-tinged: corolla yellowish white or sometimes clear yellow:* akenes very long-villous. — Probably the *H. tenuifolius* of Fl. Colorado as well as of Bot. King's Exp. From Nebraska and Montana to New Mexico and S. California.

52. POLYPTERIS, Nutt.

Herbs more or less scabrous-pubescent: with undivided and mostly entire petiolate leaves, all or the upper alternate: loosely cymose or paniculate and pedunculate heads of rose-purple flowers. In ours the rays are palmately 3-cleft.

1. **P. Hookeriana,** Gray. Stout, 1 to 4 feet high, above glandular-pubescent and somewhat viscid: leaves from narrowly to broadly lanceolate: involucre many-flowered, broad, ½ inch or more high, of 12 to 16 lanceolate bracts in two series, the outer looser and often wholly herbaceous, inner with purplish tips: ray-flowers 8 to 10, the rose-red rays ½ inch long, but sometimes reduced or abortive: pappus of the disk of thin scales attenuate at apex into a slender point or short awn, nearly the length of the akene. — Proc. Am. Acad. xix. 30. Sandy plains, from Nebraska to Texas, and extending within the eastern limits of our range.

53. CHÆNACTIS, DC.

With alternate mostly pinnately dissected leaves, pedunculate solitary or cymose heads of yellow or (in ours) white or flesh-colored flowers, and pappus mostly of entire or merely erose persistent scales (in ours 8 to 14).

1. **C. Douglasii,** Hook. & Arn. Canescent with a fine somewhat floccose tomentum, or sometimes glabrate, a span to a foot or more high: leaves mostly of broad outline and bipinnately parted into crowded short and very obtuse divisions and lobes: heads from ½ to ¾ inch long, in larger plants several or numerous and corymbosely cymose: scales of the pappus from linear-ligulate

to narrowly oblong and from ½ to ¾ the length of the corolla. — From Montana to New Mexico and westward.

Var. **alpina,** Gray. Dwarf, 3 to 5 inches high, consisting of a rosette or thick tuft of leaves with very approximate divisions, and naked or scapiform stems, bearing mostly solitary heads, surmounting the subterranean branches of a multicipital perennial caudex or rootstock. — Synopt. Fl. i. 341. Alpine region of the mountains of Colorado and Wyoming, California, and north to Washington Territory.

54. ACTINELLA, Pers., Nutt.

Low mostly herbaceous plants: with punctate and often resinous-atomiferous, aromatic herbage: leaves all alternate and narrow or with narrow lobes: the heads of yellow flowers commonly slender-pedunculate.

§ 1. *Involucre of numerous herbaceous or nearly membranous nearly equal and similar bracts, distinct to the base: heads mostly solitary on long or scapiform peduncles, rarely sessile in the cluster of leaves.*

* *Leaves mostly quite entire, all on the crowns of the caudex, which bear a simple scapiform peduncle (or none): involucre villous-lanate: scales of the pappus usually produced at apex into an awn.*

1. **A. scaposa,** Nutt. *Loosely villous and glabrate, rather sparsely cespitose,* the branches of the caudex being slender and often ascending: *scape a span to a foot high,* occasionally leafy along the base: leaves linear to lanceolate or some of the earlier ones spatulate, not rarely laciniate-lobed. — From Texas and New Mexico, but extending into Colorado under the following form:

Var. **linearis,** Nutt. Leaves all narrowly linear and entire, more rigid.

2. **A. acaulis,** Nutt. *Densely cespitose,* the branches of the caudex short, thick, and crowded, *canescently villous or sericeous,* sometimes more naked: leaves thickish, all entire, from spatulate to nearly linear, commonly short, ½ inch to 2 inches long, densely crowded on the caudex: *scape ½ inch to 6 inches high:* rays 3 to 5 inches long (rarely wanting). — Mountains and the bordering plains and hills, Dakota to Montana, and south to New Mexico and Arizona.

Var. **glabra,** Gray. Leaves green, spatulate-linear, from sparingly villous or glabrate to nearly glabrous, even to the base and axils. — Man. 363. Rocky hills and bluffs, Wyoming to New Mexico and Utah.

3. **A. depressa,** Torr. & Gray. *Pulvinate-cespitose:* leaves densely crowded on the very thick dense branches of the caudex, spatulate-linear, ½ inch long, either sericeous-canescent or glabrate: *head strictly sessile, immersed among the long-villous bases of the leaves.* — Pl. Fendl. 100. Mountains of W. Colorado or E. Utah.

* * *Leaves all quite entire, crowded on the caudex, also scattered along the simple or sparingly branched stems: peduncles slender: heads, etc., as in the last group.*

4. **A. leptoclada,** Gray. A span or two high, slender, sparsely and loosely silky-villous, glabrate, the linear leaves and lower part of the stems not rarely glabrous. — Pacif. R. Rep. iv. 107. New Mexico and S. W. Colorado.

* * * *Leaves mostly parted or dissected into narrow linear lobes, crowded on the thick comparatively simple caudex and scattered on the short flowering stems: heads large: involucre very woolly: scales of the pappus attenuate into a subulate but hardly awned point.*

5. **A. Brandegei,** Porter. *Leaves glabrate, with 2 or 3 lobes toward the upper part, or some entire,* narrowly linear, *only 2 or 3 on the somewhat scapiform* simple flowering stem (a span or more in height): *head therefore conspicuously pedunculate, ½ inch high and wide: involucral bracts lanceolate: rays 12 to 16, 3 or 4 lines long.* — Gray, Proc. Am. Acad. xiii. 373. *A. grandiflora,* var. *glabrata,* Porter, Fl. Colorad. 76. Alpine region of the mountains of S. Colorado.

6. **A. grandiflora,** Torr. & Gray. A span or two high, very stout, *floccose-woolly,* somewhat glabrate in age: stem simple or branching below, *leafy:* leaves with petiole scarious-dilated at base, *lower ones 2 to 3-ternately or quinately parted,* upper with 3 to 5 simple lobes: *involucre about an inch broad, very woolly; its bracts linear: rays 30 or more, over ½ inch long.* — Alpine regions, from Montana to Colorado.

§ 2. *Involucre double or of two distinct series of coriaceous or rigid appressed bracts, the outer connate at base: leafy-stemmed and branching.*

7. **A. Richardsonii,** Nutt. A span to a foot high, in tufts from a multicipital caudex, puberulent or nearly glabrous, woolly in the axils of radical leaves, polycephalous: upper leaves mostly once and lower twice ternately parted into long and simple filiform-linear lobes, rather rigid: involucre 2 or 3 lines high, 6 to 9-angled; the 6 to 9 bracts of the outer strongly carinate, united for the lower quarter or third: rays broadly or sometimes narrowly cuneate, 2 to 4 lines long. — Plains, Saskatchewan and E. Oregon to Utah and New Mexico.

55. HELENIUM, L. Sneeze-weed.

Herbs, with alternate simple leaves, commonly resinous-atomiferous and punctate, and with pedunculate heads of yellow flowers.

* *Leaves not decurrent, entire: rays long and narrow: bracts of the involucre numerous in two series, tardily reflexed in fruit: heads comparatively few and large.*

1. **H. Hoopesii,** Gray. Slightly tomentose or pubescent when young, soon glabrate: stem stout, 1 to 3 feet high, leafy, bearing several or sometimes solitary large heads: leaves thickish, oblong-lanceolate, or the lower spatulate with long tapering base: rays becoming an inch long, tardily reflexed: disk ½ to ¾ inch high, hemispherical: scales of the pappus ovate-lanceolate, long attenuate-acuminate, a little shorter than the corolla. — Proc. Acad. Philad. 1863, 65. Mountains of Montana to New Mexico, Arizona, and California.

* * *Stem winged by the decurrent serrate or denticulate leaves: rays cuneate or oblong, soon drooping: involucre small and simple, of linear or subulate bracts, soon reflexed: heads more numerous (corymbose) and smaller.*

2. **H. autumnale,** L. Nearly glabrous or minutely pubescent: stem very leafy, narrowly winged, 2 to 6 feet high: leaves lanceolate to ovate-oblong: heads about ½ inch in diameter, usually equalled by the rays: pappus

commonly ½ or ⅔ the length of disk-corolla. — From Arizona to British Columbia and eastward across the continent.

56. GAILLARDIA, Fougeroux.

Herbs, with alternate leaves, and ample showy heads on terminal peduncles. Ours are more or less pubescent or hirsute and leafy-stemmed, with yellow rays and disk-flowers apt to turn brown, villous akenes, and scales of the pappus slender-awned.

1. **G. aristata,** Pursh. *More or less hirsute,* often 2 feet or more high: *leaves lanceolate or broader,* or lower spatulate, *from entire to laciniate-dentate or sinuate-pinnatifid:* rays in the largest heads 1½ inches long: *lobes of disk-corolla subulate-acute and tipped with a cusp: pappus aristate.* — From New Mexico and S. Colorado to Oregon, British Columbia, and the Saskatchewan.

2. **G. pinnatifida,** Torr. *Cinereous-pubescent:* peduncles scapiform or from short leafy stems, 5 *to* 10 *inches long:* some or even all the *leaves pinnatifid,* sometimes linear or with linear lobes, sometimes spatulate and sinuate or even entire: *teeth of the disk-corolla short and broad, obtuse, pointless: pappus-scales lanceolate.* — On the plains, Colorado and Arizona to W. Texas.

57. FLAVERIA, Juss.

Glabrous herbs; with small and fascicled or glomerate heads of yellowish or yellow flowers, and opposite sessile leaves; akenes mostly smooth and glabrous.

1. **F. angustifolia,** Pers. Erect, a foot or two high: leaves from linear to lanceolate, serrulate or entire, sessile by broadish or little contracted base: heads in subsessile or short-pedunculate or leafy-involucrate chiefly terminal glomerules: involucre of mostly 3 bracts, 3 to 5-flowered or some only 2-flowered. — Alkaline soil, E. Colorado and New Mexico to W. Texas.

58. DYSODIA, Cav. Fetid Marigold.

Herbs, mostly strong-scented, with alternate or opposite leaves, and solitary or somewhat paniculate heads of yellow flowers. Ours has an involucre with accessory bracts, pubescent akenes, and opposite pinnately divided leaves.

1. **D. chrysanthemoides,** Lag. Much-branched and ill-scented annual, leafy up to the subsessile or short-pedunculate small heads: leaves 1 to 2-pinnately parted into linear lobes: involucre purplish-tinged or greenish, of 8 or 10 scarious-tipped oblong bracts, and some linear loose accessory ones: rays few and inconspicuous, not surpassing the disk. — From Arizona and Colorado to Minnesota and Louisiana, and now spreading eastward to the Atlantic States.

59. HYMENATHERUM, Cass.

Low herbs, mostly pleasant-scented; with alternate or opposite leaves, and rather small radiate heads of yellow flowers. Our species is wholly glabrous.

1. **H. aureum,** Gray. A span or two high, erect or diffuse, much branched, bearing numerous short-peduncled heads: leaves mostly alternate,

pinnately parted into 7 to 9 linear-filiform pointless divisions: involucre 3 lines high: rays about 12, oblong, 3 lines long: pappus of 6 or 8 quadrate or oblong and erose-truncate scales, in length little exceeding the breadth of the akene — Proc. Am. Acad. xix. 42. Plains of Colorado to W. Texas.

0 PECTIS, L.

Mostly low and spreading herbs, usually glabrous and scented; with narrow opposite leaves conspicuously dotted with round oil-glands; small heads of yellow flowers; and slender rigid bristles fringing at least the base of the leaves.

1. **P. angustifolia,** Torr. A span or two high, lemon-scented: leaves narrow-linear: heads subsessile or short-peduncled, fastigiate or cymose at the end of the branches: bracts of the involucre about 8, linear, at length with involute margins: pappus a crown of 4 or 5 mostly connate scales, and not rarely one or two slender usually short awns. — Ann. Lyc. N. Y. ii. 214. Dry ground, Colorado and Arizona to Texas.

61. LEUCAMPYX, Gray.

Named from the circle of bracts of the head being white-bordered.

1. **L. Newberryi,** Gray. Perennial herb, a foot or two high, flocculent-woolly, glabrate in age: leaves 2 to 3-pinnately parted into filiform-linear segments: heads few or several at the naked summit of the stem: involucre nearly ½ inch broad: rays ⅜ inch long, obscurely 3-lobed at summit, at first yellow, soon changing to cream-color or white: akenes 2 lines long, turning black. — Fl. Colorado, 77. S. W. Colorado, and W. New Mexico.

62. ACHILLEA,[1] Vaill. Yarrow.

Herbs; with small and corymbosely cymose heads of white, yellow, or even rose-colored flowers; disk commonly yellow.

1. **A. Millefolium,** L. From villous-lanate to glabrate: stems simple, a foot or two high: leaves elongated and narrow in outline, sessile, bipinnately dissected into numerous small and linear to setaceous-subulate divisions: heads numerous, crowded in a fastigiate cyme: involucre oblong; its bracts pale or sometimes fuscous-margined, or even wholly brownish: rays 4 or 5, about the length of the involucre, white, occasionally rose-color. — Common throughout the Northern hemisphere. Called either "Yarrow" or "Milfoil." Exceedingly variable.

[1] The Old-World genus *Anthemis* has several species naturalized in this country, one of which is an excessively common weed at the East, and becoming abundant within our range. It may be characterized as follows: —

A. Cotula, L. Stem rather low: herbage unpleasantly strong-scented: leaves finely 3-pinnately dissected: receptacle conical: rays mostly neutral and white or abortive: akenes 10-ribbed, rugose or tuberculate. — Known as "Mayweed" or "Dog-Fennel." *Maruta Cotula,* DC.

63. MATRICARIA,[1] Tourn., L.

Herbs, with finely once or thrice dissected leaves, and pedunculate heads, the rays white (or wanting) and the disk-flowers yellow.

1. **M. discoidea,** DC. Annual, somewhat aromatic, glabrous, a span to a foot high, very leafy: leaves 2 to 3-pinnately dissected into short and narrow linear lobes: heads all short-peduncled: bracts of the involucre broadly oval, white-scarious with greenish centre, hardly half the length of the well-developed greenish-yellow ovoid disk: akenes oblong, somewhat angled, with an obscure coroniform margin at summit, this occasionally produced into one or two conspicuous oblique auricles of coriaceous texture. — From W. California to Montana and far northward; becoming naturalized in the Atlantic States.

64. TANACETUM, Tourn. Tansy.

Strong-scented, alternate-leaved, yellow-flowered perennials. Ours are low, with stems rather slender and naked above, bearing rather small (2 lines broad) globular heads, and leaves simply or pedately 3 to 5-cleft.

1. **T. Nuttallii,** Torr. & Gray. Silvery-canescent, *loosely cespitose,* a span high: leaves short, mostly broad-cuneate with tapering base, *obtusely 3 to 5-lobed* at the broad summit; those of the flowering stems usually oblong or linear and entire: heads few, *somewhat paniculate or loosely clustered,* some of them slender-pedunculate: involucre very scarious. — Fl. ii. 415. Mountains of N. Wyoming.

2. **T. capitatum,** Torr. & Gray. Silvery-canescent, *densely cespitose,* a span high: leaves simply or pedately 3 *to* 5-*parted into linear lobes,* or some of them only 3-cleft at summit: *flowering stems scapiform* or 2 to 4-leaved: heads 10 or more, *sessile in a globose glomerule.* — Loc. cit. Mountains of N. Wyoming.

65. ARTEMISIA, Tourn., L. Wormwood. Sage-brush.

Herbs and low shrubs, bitter-aromatic; with alternate leaves and small paniculate heads, commonly nodding; the flowers yellow or whitish, usually sprinkled with resinous globules.

§ 1. *Heads heterogamous; the disk-flowers hermaphrodite but sterile, their ovary abortive, and style mostly entire: receptacle not hairy.* — Dracunculus.

* *Akenes and flowers beset with long cobwebby and crisped hairs: spinescent undershrub.*

1. **A. spinescens,** Eaton. Stout and densely branched, rigid, 4 to 18 inches high, villous-tomentose: leaves small, pedately 5-parted and the divis-

[1] The following species of the Old-World genus *Chrysanthemum* has become extensively naturalized, its broad heads and conspicuous white rays making it very prominent. It may be characterized as follows: —

C. Leucanthemum, L. Glabrous, a foot or two high, simple or sparingly branched: cauline leaves spatulate, and the upper gradually narrower, becoming small and linear, pinnately dentate or incised, partly clasping at base; radical broader, petioled: head broad and flat: rays inch long: pappus none. — Known as "Ox-eye Daisy" or "Whiteweed." *Leucanthemum vulgare,* Lam.

ions 3-lobed; lobes spatulate: heads globose, racemosely glomerate on short and leafy branchlets, which persist as slender spines: bracts of the involucre 5 or 6, broadly obovate: female flowers 1 to 4; hermaphrodite-sterile flowers 4 to 8. — Bot. King Exp. 180. Whole desert region of Wyoming, Utah, Nevada, and Idaho.

* * *Akenes nearly glabrous: no spines.*

← *Leaves dissected.*

2. **A. Canadensis,** Michx. *A foot or two high: glabrous* or mostly with at least the radical and sometimes all the leaves either sparsely or canescently silky-pubescent: *leaves mostly 2-pinnately divided* into narrow linear or almost filiform but plane lobes, of thickish texture: heads 1 or 2 lines long, *very numerous in a compound oblong or pyramidal virgate panicle: involucre greenish,* glabrous or rarely pubescent. — Across the continent to the north, and extending southward in the Rocky Mountain region to New Mexico and Arizona.

3. **A. borealis,** Pall. *A span or two high* from a stout caudex: stems simple: *leaves silky-pubescent or silky-villous; radical and lower* 1 *to* 2-*ternately or pinnately divided* into linear lobes; uppermost linear and entire or 3-parted: heads 2 lines broad, *comparatively few, crowded in a narrow* (*rarely compound*) *spiciform thyrsus with leaves interspersed:* involucre pilose or glabrate, *pale-fuscous to brownish.* — In the alpine region of Colorado, and far northward across the continent.

4. **A. pedatifida,** Nutt. *Cespitose,* with a stout lignescent caudex, *very dwarf, canescent throughout* with a fine and close pubescence: *leaves chiefly crowded in radical tufts* and on the base of the (inch or two high) *rather naked flowering stems, once or twice* 3-*parted* into narrowly spatulate or nearly linear obtuse entire divisions: *heads* (hardly 2 lines broad) *few, loosely spicately or racemosely disposed,* canescently pubescent. — Dry ground, in the mountains of Wyoming, Montana, and Idaho.

← ← *Leaves entire or* 3-*cleft or* -*parted: the whole plant or at least the base somewhat woody.*

5. **A. dracunculoides,** Pursh. *Glabrous:* stems 2 to 4 feet high, either virgately or paniculately branched: *leaves mostly entire, narrowly or sometimes more broadly linear,* some 3-cleft: heads very numerous in a compound and crowded or open and diffuse panicle, *many-flowered.* — On plains, from Saskatchewan to Texas, and westward across the continent.

6. **A. filifolia,** Torr. *Minutely canescent,* even to the 3 *to* 6-*flowered involucre,* 1 to 3 feet high, with virgate rigid branches, very leafy: *leaves all slender filiform, commonly* 3-*parted;* the upper and those in axillary fascicles entire: heads *very small,* crowded in an elongated leafy panicle. — Ann. Lyc. N. Y. ii. 211. Plains, from Nebraska to New Mexico and W. Texas.

§ 2. *Heads heterogamous; the disk-flowers hermaphrodite and fertile, with* 2-*cleft style.* — EUARTEMISIA. *Ours have the akenes obovoid or oblong and wholly destitute of pappus.*

* *Receptacle beset with long woolly hairs.*

7. **A. scopulorum,** Gray. Herbaceous, a span or two high *from a stout multicipital caudex,* silky-canescent: stems simple, *bearing* 3 *to* 12 *spicately or racemosely disposed* hemispherical (rarely solitary) heads: *radical and few lower*

cauline leaves pinnately 5 *to* 7*-divided, and divisions* 3*-parted into spatulate-linear lobes;* uppermost simply 3 to 5-parted or entire: involucre 2 lines broad, *villous;* its bracts brown-margined: *corollas hirsute at summit.* — Proc. Acad. Philad. 1863, 66. Alpine region, mountains of Colorado, Utah, and Wyoming.

8. **A. frigida,** Willd. Herbaceous *from a suffrutescent base,* silky-canescent and *silvery,* about a foot high: stems simple or branching, *bearing numerous racemosely disposed heads in an open panicle: leaves mainly twice ternately or quinately divided or parted into linear crowded lobes,* and usually a pair of simple or 3-parted stipuliform divisions at base of the petiole: heads globular, barely 2 lines in diameter: involucre pale, *canescent,* its outer bracts narrow and herbaceous: *corollas glabrous.* — From Minnesota to Texas and westward to New Mexico, Nevada, and Idaho.

* * *Receptacle not villous.*

\+ *Annual and biennial.*

9. **A. biennis,** Willd. Wholly glabrous, inodorous and nearly insipid: stem strict, 1 to 3 feet high, leafy to the top, bearing close glomerules of small heads in the axils from toward the base of the stem to the somewhat naked and spiciform summit: leaves 1 to 2-pinnately parted into lanceolate or broadly linear laciniate or incisely toothed lobes; or the uppermost small, sparingly pinnatifid and less toothed. — Open grounds from California and Oregon to Hudson's Bay; also now spreading to the eastern seaboard farther south.

\+ \+ *Perennials.*

\+\+ *Heads many-flowered, broad* (2 *to* 5 *lines*), *several or numerous and loosely racemose or paniculate on mostly simple stems: alpine and subalpine, with dissected leaves and no cottony tomentum.*

10. **A. Norvegica,** Fries. Rather stout, 5 to 25 inches high, from *villous or pubescent to glabrate: leaves twice* 3 *to* 7*-parted* into linear or lanceolate or more dilated segments: *heads* 4 *or* 5 *lines broad,* loosely racemose or racemose-paniculate, *most of them long-peduncled:* bracts of the involucre broadly brown-margined: corollas loosely pilose, rarely almost glabrous. — Mostly *A. arctica* of the Western Reports. From the high mountains of S. Colorado and S. California far northward.

11. **A. Parryi,** Gray. Rather stout, a foot or less high, *wholly glabrous,* leafy up to the loosely paniculate inflorescence of numerous *short-peduncled heads: leaves* 2 *to* 3*-pinnately parted* into mostly linear thickish lobes: *involucre* 2 *or* 3 *lines broad,* its bracts greenish with brownish margins and with the corollas glabrous. — Proc. Am. Acad. vii. 361. Mountains of Colorado, at Sangre de Cristo Pass.

\+\+ \+\+ *Heads comparatively small* (1 *to* 3 *lines high and broad*), 12 *to many-flowered, variously paniculate: flowers glabrous: herbs, mostly whitened* (*at least when young and on the lower surface of the leaves*) *with cottony tomentum.*

= *Tall, with numerous amply paniculate heads, strict stems, and undivided elongated-lanceolate or linear leaves,* 3 *to* 7 *inches long.*

12. **A. serrata,** Nutt. *Stems* 6 *to* 9 *feet high,* very leafy: leaves green and glabrous above, white-tomentose beneath, lanceolate or uppermost linear, *all serrate with sharp narrow teeth,* pinnately veined, the earliest sometimes pin-

nately incised: heads rather few-flowered, less than 2 lines long, greenish, *hardly pubescent.* — Prairies, Dakota to Illinois.

13. **A. longifolia,** Nutt. *Stem 2 to 5 feet high: leaves entire,* at first tomentulose, but usually glabrate above, white-tomentose beneath, linear or linear-lanceolate (1 to 5 lines wide): *heads usually canescent,* 2 or 3 lines long. — Minnesota and Nebraska to Montana.

= = *Not so tall: leaves more or less cleft or divided, or when entire comparatively short, not filiform nor narrowly linear.*

a. *Involucre from canescent to woolly,* 12 *to* 20*-flowered.*

14. **A. Ludoviciana,** Nutt. A foot to a yard high, *simple or with virgate branches;* sometimes paniculate, *completely and somewhat flocculently white-tomentose,* or upper face of leaves sometimes early glabrate and green: leaves from linear-lanceolate to oblong, sometimes nearly all undivided and entire; commonly *the lower with a few coarse teeth or incisions, or* 2 *to* 3*-cleft, or irregularly* 3 *to* 5*-parted* into lanceolate or linear entire lobes: *heads glomerately paniculate,* not over 2 lines long: *involucre woolly-tomentose.* — Including also var. *guaphalodes,* Torr. & Gray. Across the continent from the west to Michigan and Illinois.

15. **A. Mexicana,** Willd. *Paniculately branched,* 2 to 4 feet high, *less tomentose:* leaves narrow-lanceolate to linear, commonly attenuate, some 3 to 5-cleft or parted; *radical cuneate, incisely pinnatifid or trifid:* heads very numerous in an *ample loose panicle,* many pedicellate, 1 to 2 lines long: *involucre arachnoid-canescent* or glabrate, largely scarious. — *A. Ludoviciana,* var. *Mexicana,* Gray. Dry plains, from S. Nevada, S. Colorado, and Arizona to Texas and Arkansas.

b. *Involucre glabrous,* 20 *to* 40*-flowered.*

16. **A. franserioides,** Greene. Glabrous throughout, or minutely and obscurely puberulent: stem rather stout, 2 or 3 feet high: leaves comparatively ample, green above, *pale and barely cinereous beneath;* lower bipinnately and upper simply pinnately parted into *lanceolate-oblong obtuse entire or* 2 *to* 3*-cleft divisions and lobes:* heads numerous, *loosely racemose on the branches of the leafy elongated panicle,* 2 or 3 lines broad. — Bull. Torr. Club, x. 42. Mountains of S. Colorado, New Mexico, and Arizona.

17. **A. discolor,** Dougl. A foot high, mostly slender, glabrous or glabrate except the lower face of the leaves: *these white with close cottony tomentum,* 1 to 2-pinnately parted into *narrow linear or lanceolate entire or sparingly laciniate divisions and lobes: heads glomerate in an interrupted spiciform or virgate panicle,* 1 or 2 lines high. — Mountains of British Columbia and Montana to Utah, Nevada, and California.

Var. **incompta,** Gray. Stouter, with coarser or less dissected leaves, having mostly broader lobes, or the upper entire. — Synopt. Fl. i. 373. *A. incompta,* Nutt. Mountains from Wyoming and Montana to California and Washington Territory.

= = = *Rather low: leaf-divisions narrowly linear or filiform: heads* 15 *to* 20*-flowered, in a narrow thyrsoid or spiciform panicle.*

18. **A. Wrightii,** Gray. Cinereous or canescent, or radical shoots sometimes white-tomentose, 10 to 20 inches high, very leafy up to the panicle:

leaves pinnately 5 to 7-parted into very narrow linear and by revolution filiform entire divisions: involucre minutely cinereous-canescent, becoming glabrate. — Proc. Am. Acad. xix. 48. Plains of Southern Colorado and New Mexico.

+++ +++ +++ *Heads small and narrow, very few-flowered: flowers glabrous: stems woody at base.*

19. **A. Bigelovii,** Gray. Silvery-canescent throughout, a foot high: leaves from oblong- to linear-cuneate, mostly 3-toothed at the truncate apex, about ½ inch long: heads very numerous and crowded in the oblong or virgate thyrsiform panicle, tomentose-canescent, containing only one or two hermaphrodite and as many female flowers, all fertile. — Pacif. R. Rep. iv. 110. Rocky banks, Colorado, on the Upper Canadian and Arkansas.

§ 3. *Heads homogamous, the flowers all hermaphrodite and fertile: receptacle not hairy.* — SERIPHIDIUM. *Ours are the true "Sage-brushes," being rather shrubby, canescent or silvery with a fine or close tomentum, and heads not nodding.*

20. **A. arbuscula,** Nutt. *Dwarf,* a span or rarely a foot high, *with a stout base* and slender flowering branches: *leaves short,* cuneate or flabelliform, *3-lobed or parted, with the lobes oborate to spatulate-linear, sometimes again 2-lobed;* those subtending the heads usually entire and narrow: *panicle strict and comparatively simple and naked,* often spiciform and reduced to few rather scattered sessile heads: involucre 5 to 9-flowered. — High mountains and elevated plains, from Wyoming and Utah to Idaho and California.

21. **A. tridentata,** Nutt. *Larger,* 1 *to* 6 (*or even* 12) *feet high,* much branched: *leaves cuneate, obtusely* 3-*toothed or* 3-*lobed, or even* 4 *to* 7-*toothed, at the truncate summit, uppermost cuneate-linear: heads densely paniculate: involucre* 5 *to* 8-*flowered,* its outer or accessory tomentose-canescent bracts short and *ovate.* — From Montana to Colorado and westward. Immensely abundant; the characteristic "Sage-brush," or "Sage-wood."

22. **A. trifida,** Nutt. A foot or two high, sometimes lower, much branched: *leaves* 3-*cleft and* 3-*parted; the lobes and the entire upper leaves narrowly linear or slightly spatulate-dilated:* heads numerous in the contracted leafy panicle, or spicately disposed on its branches: *involucre* 3 *to* 5-*flowered,* rarely 6 to 9-flowered, its outer or accessory bracts oblong to *short-linear or lanceolate.* — Wyoming and Utah to Washington Territory and California.

23. **A. cana,** Pursh. A foot or two high, freely branched, *silvery canescent: leaves lanceolate-linear or narrower, somewhat tapering to both ends,* an inch or two long, *entire, rarely with* 2 *or* 3 *acute teeth or lobes,* margins not revolute: heads glomerate in a leafy contracted panicle, 6 *to* 9-*flowered,* rarely 5-flowered, usually with one or two *linear* subulate accessory bracts. — Plains, Saskatchewan to Montana, Dakota, and Colorado.

66. PETASITES, Tourn. BUTTER-BUR. SWEET COLTSFOOT.

Perennial herbs, with thickish and creeping rootstocks, sending up scapiform simple flowering stems and ample radical leaves on strong petioles, cottony-tomentose or glabrate; the flowers whitish or purplish.

1. **P. sagittata,** Gray. Leaves from deltoid-oblong to reniform-hastate, from acute to rounded-obtuse, repand-dentate, very white-tomentose beneath, when full grown 7 to 10 inches long: heads short-racemose becoming corymbose. — Bot. Calif. i. 407. Wet ground, in the mountains of Colorado and northward; across the continent in northern latitudes.

67. HAPLOESTHES, Gray.

The name refers to the few (4 or 5) bracts of the involucre.

1. **H. Greggii,** Gray. Somewhat fleshy, herbaceous or suffrutescent, a foot or two high, fastigiately branched, glabrous, leafy up to the loose cymes of a few slender-pedunculate naked heads: leaves all opposite, very narrowly linear or filiform, entire; the lower connate at base: heads 2 or 3 lines high: flowers yellow: ligules 1 or 2 lines long. — Pl. Fendl. 109. Saline soil, S. E. Colorado to W. Texas.

68. TETRADYMIA, DC.

Low and rigid shrubs, sometimes spinescent, canescently tomentose; with alternate and sometimes fascicled narrow and entire leaves, cymose or clustered heads of yellow flowers, and a copious white pappus.

* *Involucre 4-flowered, of 4 or 5 bracts: pappus extremely copious: akenes either very villous or glabrous: undershrubs, a foot or two high.*

1. **T. canescens,** DC. *Permanently canescent with a dense close tomentum, unarmed,* fastigiately branched: leaves from *narrowly linear to spatulate-lanceolate,* an inch or less long: heads ½ to ¾ inch long, most of them short-pedunculate. — Hills and plains, N. Wyoming and British Columbia to New Mexico, Arizona, and California.

Var. **inermis,** Gray. A form with shorter and crowded branches, shorter leaves more inclined to spatulate and lanceolate, and smaller heads. — Bot. Calif. i. 408. The commonest form.

2. **T. glabrata,** Gray. *Whitened with looser at length deciduous tomentum, unarmed:* branches more slender, spreading: leaves at length naked and green, primary ones *slender-subulate, cuspidate, on young shoots appressed,* half-inch long; those of fascicles in their axils spatulate-linear, fleshy, pointless: heads mostly short-pedunculate: involucre often glabrate. — Pacif. R. Rep. ii. 122. From Colorado and Utah to California and Oregon.

3. **T. Nuttallii,** Torr. & Gray. Pubescence and foliage of *T. canescens,* var. *inermis, bearing rigid divergent spines in place of primary leaves:* leaves of the axillary fascicles mostly spatulate: *heads more glomerate.* — Fl. ii. 447. Utah and Wyoming.

* * *Involucre 5 to 9-flowered, of 5 or 6 broader bracts: proper pappus less copious, reduced nearly or quite to a single series of bristles, which are covered by a false pappus of extremely long very soft and white woolly hairs which densely clothe the akene: shrubs 2 to 4 feet high, at least the branches densely white-tomentose.*

4. **T. spinosa,** Hook. & Arn. Branches divaricate, rigid, bearing rigid and straight or recurved spines in place of primary leaves: secondary leaves

fascicled in the axils, small, fleshy, linear-clavate, glabrous or glabrate: heads scattered, pedunculate, fully ½ inch long: pappus of comparatively rigid capillary bristles, a little surpassing the wool of the akene. — From S. Wyoming to Arizona, S. E. California, and E. Oregon.

69. ARNICA, L.

Perennial herbs; with erect stems, simple or branching, opposite leaves, and comparatively large long-pedunculate heads of yellow flowers.

* *Radical leaves cordate at base, on slender or sometimes winged petioles; cauline all opposite, in* 1 *to* 3 *pairs, dentate or denticulate.*

1. **A. cordifolia,** Hook. A foot or two, or when alpine a span or two high, pubescent, or the stems hirsute and peduncles villous: *lower cauline as well as radical leaves long-petioled, deeply cordate,* yet sometimes only ovate; upper cauline small, sessile: heads few, in smaller plants solitary: involucre ⅔ inch long, pubescent or villous: rays commonly an inch long: *akenes more or less hirsute.* — From the mountains of Colorado to those of California and British Columbia.

Var. **eradiata,** Gray. An ambiguous form; with smaller and rayless heads, and oblong-ovate at most subcordate leaves. — Synopt. Fl. i. 381. Montana and E. Oregon.

2. **A. latifolia,** Bong. Minutely pubescent or commonly glabrous, with *smaller heads* than the preceding: *only radical leaves cordate* or subcordate and petioled; *cauline* 2 or 3 pairs, equal, *ovate or oval, usually sharply dentate, closely sessile by a broad base,* or lowest with contracted base: *akenes commonly glabrate or glabrous.* — Pine woods, mountains of Colorado and Utah to Oregon, British Columbia, and Alaska.

* * *No cordate leaves; radical leaves petioled, tapering or abrupt at base.*

+ *Leafy to the top: cauline leaves seldom less than* 4 *pairs, and the upper not conspicuously diminished.*

3. **A. Chamissonis,** Less. *From tomentose or villous-pubescent to nearly glabrous: leaves oblong or oblong-lanceolate,* denticulate or dentate, acute or obtuse; *lowest tapering into a margined petiole, upper broad at base and somewhat clasping:* akenes hirsute-pubescent. — Including *A. mollis,* Hook.; also *A. latifolia* in part, of the Western Reports. Mountains of Colorado and Utah to those of California and far northward.

4. **A. longifolia,** Eaton. *Many-stemmed in a tuft, minutely puberulent:* cauline leaves *elongated-lanceolate,* tapering to both ends, entire or denticulate, somewhat nervose, 3 to 6 inches long, *lower with narrowed bases connate-vaginate:* heads corymbosely disposed, short-peduncled: akenes minutely glandular, not hairy. — Bot. King Exp. 186. Wahsatch Mountains and westward.

5. **A. foliosa,** Nutt. *Tomentose-pubescent, strict: leaves lanceolate,* denticulate, nervose; *upper partly clasping by narrowish base, lower with tapering bases connate:* heads short-peduncled, rarely solitary: akenes hirsute-pubescent or glabrate. — *A. Chamissonis* of the Western Reports, in part. From the Saskatchewan to Oregon and southward along the mountains to N. California and Colorado.

+– +– *Less leafy: cauline leaves* 1 *or* 2 (*rarely* 3) *pairs, and the upper mostly small.*

6. **A. Parryi,** Gray. A foot or less high, slender, simple, somewhat hirsutely pubescent and above glandular: *leaves membranaceous,* commonly denticulate; radical oval to ovate-oblong, 1 to 3 inches long, *abruptly or cuneately contracted at base into a short margined petiole;* cauline remote: involucre hirsute and glandular, ½ inch or less high: *heads rayless,* occasionally some outermost corollas ampliate: *akenes glabrous* or with a few sparse hairs. — Am. Nat. viii. 213. *A. angustifolia,* var. *eradiata,* Gray. Mountains from Colorado to Wyoming and westward.

7. **A. alpina,** Olin. A span to 18 inches high, pubescent, hirsute, or at summit villous, strict, simple and monocephalous, occasionally 3-cephalous: *leaves thickish, from narrowly oblong to lanceolate, or the radical oblong-spatulate* and small uppermost linear, entire or denticulate, 3-nerved; bases of the cauline hardly at all connate: *heads conspicuously radiate: akenes hirsute-pubescent,* rarely glabrate. — *A. angustifolia,* Vahl. In the mountains of Colorado and California; across the continent in high latitudes.

70. SENECIO, Tourn. Groundsel.

A very large genus; with alternate leaves and heads of yellow flowers. Ours all belong to the section of perennials having the pubescence (if any) of a tomentose or floccose kind and never viscid nor hirsute.

* *Heads an inch or distinctly over* ½ *inch high, very many-flowered.*

+– *Heads radiate.*

+– +– *Alpine species.*

1. **S. Soldanella,** Gray. *Apparently glabrous from the first,* a span high, *somewhat succulent:* leaves mostly radical and long-petioled, *from round-reniform to spatulate-obovate, denticulate or entire; cauline one or two or none:* head solitary, erect, *two thirds to nearly a full inch high:* involucral bracts lanceolate and a very few calyculate ones: rays 6 to 10, *oblong, a quarter-inch long.* — Proc. Acad. Philad. 1863, 67. High alpine, in the mountains of Colorado.

2. **S. amplectens,** Gray. *Lightly floccose-woolly at first,* soon glabrate, a foot or so high, *few to several-leaved,* terminated by one or two long-pedunculate nodding heads: *leaves thinner* than in the foregoing, from *denticulate to conspicuously and sharply dentate; radical obovate to spatulate,* tapering into a winged petiole; cauline as large or larger, oblong or narrower, half-clasping or more, the upper by a broad base: involucre over *half-inch high,* of linear bracts and a few loose calyculate ones: *rays linear, inch long or more,* acute or acutely 2 to 3-toothed at tip. — Am. Jour. Sci. II. xxxiii. 240. Alpine and subalpine region, mountains of Colorado.

Var. **taraxacoides,** Gray. Only a span or two high, with fewer and smaller cauline leaves; these and the radical commonly spatulate and with tapering base, not rarely laciniately subpinnatifid: head smaller, even down to half-inch, and with rays of only the same length. — Proc. Acad. Philad. 1863, 67. High alpine, in the mountains of Colorado and Nevada.

+ + Not alpine, with leafy stems a foot or so high.

3. **S. megacephalus,** Nutt. About a foot high, loosely floccose-woolly, tardily glabrate, leafy: leaves entire, lanceolate, or the radical spatulate-lanceolate and tapering into a petiole, and uppermost cauline attenuate, thickish: heads 1 to 3, short-peduncled, 8 lines to an inch high: involucre calyculate by some very loose and subulate elongated accessory bracts: rays over ½ inch long. — From the mountains of Idaho to the Rocky Mountains near the British boundary.

+ + Heads rayless, nodding: some sparse crisped hairs in place of tomentum.

4. **S. Bigelovii,** Gray. Robust, 2 or 3 feet high, leafy up to near the racemiform or simply paniculate inflorescence, at length glabrate: leaves from elongated-oblong to lanceolate, denticulate or dentate, acute or acuminate; radical and lower cauline 3 to 6 inches long, abrupt at base and naked-petioled, or tapering into a winged petiole or partly clasping base; upper lanceolate with partly clasping base: heads in small plants few or solitary. — Pacif. R. Rep. iv. 111. Includes also var. *Hallii*, Gray. Mountains of Colorado, New Mexico, and Arizona.

** * Heads middle-sized or small, half-inch or less,*

+ Nodding, rayless: leafy-stemmed.

5. **S. cernuus,** Gray. Quite glabrous, 2 or 3 feet high: leaves lanceolate or the larger oblong-lanceolate, entire, denticulate, rarely with a few scattered coarser teeth, all tapering at base into a barely margined petiole, or upper into a narrowed not clasping base: heads (4 to almost 6 lines long) several or numerous in the panicle, most of them decidedly nodding: flowers pale yellow. — Am. Jour. Sci. II. xxxiii. 10. Mountains of Colorado, wholly below the alpine region.

+ + Heads erect, mostly radiate.

+ Stems numerously and nearly equably leafy to the top: leaves from entire to laciniate-dentate, never divided or dissected, nor narrowly linear: glabrous or very early glabrate.

= Low, alpine: heads subsolitary, radiate.

6. **S. Fremonti,** Torr. & Gray. Many-stemmed from a thickish caudex, a span to a foot high: leaves thickish, from rounded-obovate or spatulate to oblong, 1 to 2 inches long, obtuse, obtusely or acutely dentate, sometimes even pinnatifid-dentate; lower abruptly contracted into a winged petiole; uppermost sessile by broadish base: heads ½ inch high: rays 3 to 5 inches long. — Fl. ii. 445. Alpine regions, from the British boundary to S. Colorado, Utah, and California.

Var. **occidentalis,** Gray. More slender, with rounder leaves and heads longer-peduncled; in high alpine stations becoming very dwarf, and flowering almost from the ground. — Bot. Calif. i. 618. Mountains of N. Wyoming, Montana, and California.

= = Rather low, with numerous cymosely paniculate and small heads, always rayless.

7. **S. rapifolius,** Nutt. About a foot high: leaves ovate or oblong, throughout very sharply and unequally dentate, rather fleshy; radical tapering

into a petiole, cauline mostly clasping by a broad subcordate base: heads 3 lines high, about 15-flowered: involucral bracts 8 to 10, narrowly oblong. — Rocky Mountains, Wyoming, about the sources of the Platte.

= = = *Tall, with corymbosely cymose and radiate heads: leaves nearly membranaceous.*

8. **S. triangularis,** Hook. Rather stout: stem simple, 2 to 5 feet high, bearing several or somewhat numerous heads in a corymbiform open cyme: *leaves all more or less petioled and thickly dentate* with more or less salient teeth, *deltoid-lanceolate, or the lower triangular-hastate or deltoid-cordate, and uppermost lanceolate with cuneate base:* rays 6 to 12. — From the Saskatchewan to Washington Territory and southward in the mountains to Colorado and California.

9. **S. serra,** Hook. Strict, 2 to 4 feet high, very leafy, sometimes simple and bearing rather few heads, commonly branching at summit, then bearing numerous corymbosely paniculate smaller heads: leaves 4 to 6 inches long, *all lanceolate and tapering to both ends, sessile by a narrow base,* or the lowest oblong-spatulate and tapering into a short petiole, *usually with the whole margin thickly serrate or serrulate* with very acute salient teeth: rays 5 to 8. — In the Western Reports principally under the name of *S. Andinus.* Mountains of Colorado to Idaho and Wyoming.

Var. **integriusculus,** Gray. Heads smaller, 3 or 4 lines high, and narrower, fewer-flowered: leaves minutely serrate or denticulate, or the upper entire, sometimes all entire or nearly so, generally shorter and smaller, or broader and not acuminate. — Synopt. Fl. i. 387. *S. Andinus,* Nutt. From Wyoming to Oregon and California.

++ ++ *Stem not numerously but somewhat equably leafy up to the inflorescence: leaves all entire or denticulate: involucre fleshy-thickened.*

10. **S. crassulus,** Gray. A foot or less high, glabrous: stem 5 to 7-leaved, bearing 3 to 8 pedunculate rather large and thick heads: leaves oblong-lanceolate, apiculate-acute, 2 to 5 inches long; radical and lowest cauline spatulate or obovate-oblong, narrowed into a short winged petiole; upper sessile by partly clasping or decurrent base: involucre 40 to 50-flowered, of 12 fleshy-thickened but thin-edged bracts, the base also thickened, the whole becoming conical and multangular in fruit: rays about 8. — Proc. Am. Acad. xix. 54. *S. integerrimus,* Gray, in part; *S. lugens,* var. *Hookeri,* Eaton, in part. Subalpine, mountains of Colorado to Utah and Wyoming.

++ ++ ++ *Stems either few-leaved or with the upper leaves reduced in size; the inflorescence therefore naked: none with narrow linear leaves.*

= *Tall and simple-stemmed, with a fibrous cluster of roots: leaves fleshy coriaceous, all entire or barely denticulate.*

11. **S. hydrophilus,** Nutt. Very glabrous or smooth: stem robust, 2 to 4 feet high, strict: leaves lanceolate; radical oblanceolate and stout-petioled, sometimes a foot long; upper cauline sessile or partly clasping: heads numerous in a branching cyme: bracts 8 to 12: disk-flowers 15 to 30; rays 3 to 6 and small, or none. — In water or very wet ground, from Colorado and California to Montana and British Columbia.

= = *Plants mostly in clumps or tufts, or from tufted or creeping rootstocks.*

a. *Stems mostly robust, generally a foot to* 3 *or* 5 *feet high, bearing numerous heads in a cyme: rays* 8 *to* 12, *conspicuous: leaves from entire to dentate, none really cordate nor with permanent tomentum. None truly alpine.*

12. **S. integerrimus,** Nutt. *Leaves oblong-lanceolate, or the radical elongated-oblong, quite entire or denticulate;* upper ones reduced and bract-like, *attenuate-subulate from a dilated base:* heads several, *umbellately cymose,* commonly ½ inch high: involucral bracts narrow, acute or acuminate. — Dakota to Wyoming and the Saskatchewan.

13. **S. lugens,** Richards. Lightly floccose-woolly when young, in the typical form early glabrate and bright green: stem 6 inches to 2 feet high, few- and small-leaved and naked above, terminated by a cyme of several or rather numerous heads: *radical and lower cauline leaves spatulate,* varying to oval or oblong, *either gradually or abruptly contracted at base into a winged or margined short petiole, usually repand- or callous-denticulate;* upper cauline lanceolate or reduced and bract-like: bracts of the involucre lanceolate, with obtuse or acutish *commonly blackish tips:* rays 10 or 12, conspicuous. — Includes var. *Hookeri* and var. *Parryi.* Through the whole Rocky Mountains to New Mexico and westward to California.

Var. **foliosus,** Gray. Floccose wool usually persistent up to flowering, and vestiges remaining to near maturity: stem seldom over a foot high, stouter, more leafy to near the inflorescence: leaves comparatively large, oblong to broadly lanceolate: heads often very numerous and crowded in the corymbiform cyme, then narrower: tips of involucral bracts conspicuously blackish. — Bot. Calif. i. 413. *S. lugens,* var. *exaltatus,* Eaton. Mountains of Colorado and Utah.

Var. **exaltatus,** Gray. Lightly floccose when young, and not rarely with looser and more persistent scattered hairs: stem stout, 1 to 3 or even 4 or 5 feet high: leaves thickish; radical longer-petioled, from spatulate-lanceolate to obovate or ovate, the broader ones abrupt and sometimes even subcordate at base; cauline occasionally laciniate-dentate: heads mostly numerous in the cyme. — Loc. cit. *S. exaltatus,* Nutt. Wet ground, British Columbia and Idaho to California, extending within the western limits of our range.

b. *Stems low, only* 2 *to* 6 *inches high, scapiform: leaves clustered on the rootstock or caudex, entire or crenate; those of the scape reduced to mere bracts. Chiefly alpine or subalpine.*

1. *Leaves thick and coriaceous, tapering into a petiole, crowded on the multicipital caudex.*

14. **S. werneriæfolius,** Gray. *Woolly and canescent,* tardily glabrate: *leaves quite entire,* erect or ascending, *from spatulate-linear* (2 or 3 inches long, including the petiole-like base) *to elongated-oblong* and short-petioled, the margins sometimes revolute: *scape a span high, rather stout, bearing* 2 *to* 8 *heads;* these 4 or 5 lines high: *rays* 10 *or* 12, oblong, 2 lines long, rarely few or wanting. — Proc. Am. Acad. xix. 54. *S. aureus,* var. *werneriæfolius,* Gray. Mountains of Colorado, alpine.

15. **S. petræus,** Klatt. *Glabrous or early glabrate: leaves from orbicular-obovate or oval* (¼ to ½ inch long) *to cuneate-oblong, entire or* 3 *to* 7*-crenate-toothed at the broad summit,* abruptly petioled: *scapes* 1 *to* 3 *inches high, bearing solitary or several clustered heads;* these 4 or 5 lines high: *rays* 6 *to* 10, golden yellow, 3 lines long. — *S. aureus,* var. *alpinus,* Gray. Alpine region of the mountains of Colorado, Utah, and California.

2. *Leaves round-cordate, crenate, purple-tinged beneath, slender-petioled, more or less clustered at the base of the scape: plants very glabrous.*

16. **S. renifolius,** Porter. Two inches high from filiform creeping rootstocks: leaves thickish, resembling those of *Ranunculus Cymbalaria,* rounded-subcordate or reniform, only about ½ inch wide, coarsely 5 to 7-crenate: scape or peduncle little surpassing the leaves, bearing a solitary comparatively large (½ inch long) head: rays about 8, oblong, 4 lines long. — Fl. Colorad. 83. High alpine region on Whitehouse Mountain, in Central Colorado, at 13,000 feet, *J. M. Coulter.*

c. *Stems a foot or two high or less, bearing some leaves and corymbosely cymose heads. Mostly not alpine: usually some floccose tomentum.*

1. *Leaves from entire or serrate to pinnatifid in the same species, none pinnately divided: rays sometimes wanting.*

17. **S. canus,** Hook. *Permanently tomentose-canescent,* or at length flocculent, but rarely at all glabrate: stems from a span to 2 feet high: *leaves sometimes all undivided or even entire, the radical and lower from spatulate to oblong,* ½ to 1½ inches in length, slender-petioled, sometimes laciniate-toothed or pinnatifid: *akenes very glabrous.* — From Dakota to Colorado and west to California and British Columbia.

18. **S. aureus,** L. *Very early glabrate,* usually quite free from wool at flowering and a foot or two high from small rootstocks: *radical leaves mostly rounded and undivided, and cauline lanceolate and pinnatifid or laciniate:* most polymorphous species, of which the typical form is *bright green,* 1 to 3 feet high: leaves thin; principal radical ones *roundish, cordate or truncate at base,* crenate-dentate, 1 to 3 inches in diameter, on long slender petioles; lower cauline similar, with 2 or 3 lobes on the petiole, *or lyrately divided or lobed;* others more laciniate-pinnatifid and lobes often incised; uppermost sparse and small, with closely sessile or auriculate-dilated incised base: *akenes quite glabrous.* — Very abundant, across the continent. The following are the principal forms within our range.

Var. **Balsamitæ,** Torr. & Gray. Less glabrate, not rarely holding more or less wool until fruiting: depauperate stems a span or two, larger fully 2 feet high: principal or *earliest radical leaves oblong,* sometimes oval, commonly verging to lanceolate, inch or two long, *serrate, contracted into slender petioles; the succeeding lyrately pinnatifid:* heads usually rather small and numerous: akenes almost always *hispidulous-pubescent* on the angles. — From Texas to Colorado and British Columbia and eastward to Canada.

Var. **compactus,** Gray. A span or two high, *in close tufts,* rather rigid, when young whitened with fine tomentum, glabrate in age: *radical leaves oblanceolate or attenuate-spatulate, entire or* 3*-toothed at apex, or pinnatifid-dentate,* an inch or more long, thick and firm at maturity; cauline lanceolate or

linear, entire or pinnatifid: heads rather numerous and crowded in the cyme, rather small: ovaries *papillose-hispidulous* on the angles — Synopt. Fl. i. 391. From Colorado to N. W. Texas; mostly in saline soil.

Var. **borealis,** Torr & Gray. A foot down to a span high, at summit bearing either numerous or few heads; these not rarely rayless: leaves thickish; *radical from roundish with abrupt or even truncate base to cuneate-obovate and cuneate-spatulate,* ½ to 1 inch long, slender-petioled; cauline seldom much pinnatifid: *akenes glabrous.* — Mountains of Colorado, California, and northward, where it extends across the continent.

Var. **croceus,** Gray. A span to a foot or two high, glabrous or early glabrate: leaves somewhat succulent; *radical oblong to roundish, sometimes lyrate;* cauline very various: heads usually numerous in the cyme: *flowers saffron-colored or orange,* at least the rays, or these sometimes wanting. — Proc. Acad. Philad. 1863, 68. Mountains of Colorado to Montana, Nevada, and California.

Var. **subnudus,** Gray. Wholly glabrous or glabrate, slender, *a span or two high, bearing 2 or 3 small cauline leaves and a solitary head,* or not rarely a pair: radical leaves few, spatulate or obovate, sometimes roundish, half-inch or less long, occasionally lyrate; cauline incised or sparingly pinnatifid: rays conspicuous. — Synopt. Fl. i. 391. Wyoming to British Columbia and California.

19. **S. Fendleri,** Gray. *Very canescent with floccose wool,* in age tardily glabrate: stems rather stout, 5 to 15 inches high, leafy, the larger plants branching: *leaves oblong-lanceolate* or narrower; *radical sometimes almost entire,* more commonly like the *cauline sinuately pectinate-pinnatifid* or even pinnately parted, the short oblong divisions incisely 2 to 4-lobed: *akenes glabrous.* — Pl. Fendl. 108. Mountains of Colorado and New Mexico.

2. *Leaves mostly once pinnately divided or parted and again lobed or incised.*

20. **S. eremophilus,** Richards. Stems freely branching, leafy up to the inflorescence: leaves mostly oblong in outline, laciniately-pinnatifid or pinnately parted, the lobes usually incised or dentate: heads in corymbiform cymes, short-peduncled: bracts commonly purple-tipped: rays 7 to 9: akenes minutely papillose or glabrous. — In the Rocky Mountains, from New Mexico to the Mackenzie River.

++ ++ ++ ++ *Stems leafy, numerously or somewhat equably so up to the top: leaves all pinnately lobed or parted or entire, their divisions (or the whole leaf) linear to filiform.*

21. **S. Douglasii,** DC. Lignescent and sometimes decidedly shrubby at base, many-stemmed, a foot or two or even 5 or 6 feet high, either white-tomentose or glabrate and green: leaves thickish, sometimes all entire and elongated-linear, more commonly pinnately parted into 3 to 7 linear or nearly filiform entire divisions: heads several or numerous and cymose, from ½ to ½ inch high: rays 8 to 18: akenes canescent with a fine strigulose pubescence. — *S. longilobus,* Benth.; *S. filifolius,* Nutt. Plains and hills, Nebraska to Texas and westward to California.

71. CNICUS,[1] Tourn., L., partly. Plumed Thistle.

Stout herbs; with sessile leaves, commonly with prickly teeth and tips, and large or middle-sized heads: the flowers red or purple, rarely white or yellowish. — *Cirsium*, DC.

* *Bracts of the ovoid or hemispherical involucre appressed-imbricated and the outer successively shorter, all with loose and dilated fimbriate or lacerate white-scarious tips.*

1. **C. Americanus,** Gray. A foot or two high, branching above: branches bearing solitary or scattered naked heads: leaves white-tomentose beneath, lanceolate or broader, sinuately pinnatifid, or some merely dentate, others pinnately parted, weakly prickly: *heads erect*, an inch high: principal bracts of the involucre naked-edged or merely fimbriate-ciliate below, and the dilated scarious apex as broad as long, fimbriate-lacerate, tipped with a barely exserted cusp; innermost with lanceolate nearly entire scarious tips: flowers ochroleucous: stronger pappus-bristles dilated-clavellate at tip. — Proc. Am. Acad. xix. 56. Lower mountains of Colorado and New Mexico to California.

* * *Bracts of the involucre mostly loose, not appressed-imbricated nor rigid, tapering gradually from a narrow base to a slender-prickly or muticous apex; outer not very much shorter than the inner, wholly destitute of dorsal glandular ridge or spot: pappus-bristles not clavellate-tipped.*

2. **C. Parryi,** Gray. Green, lightly arachnoid and villous when young, 2 feet or so high: *leaves lanceolate, sinuate-dentate, not decurrent, moderately prickly:* heads several and spicately glomerate or more racemosely paniculate, more or less bracteose-leafy at base: *accessory and outer proper bracts* or some of them *pectinately fimbriate-ciliate down the sides, innermost with more or less dilated or margined mostly lacerate-fimbriate tips:* corollas pale yellow; the lobes longer than the throat: pappus of fine soft bristles, none of them obviously clavellate. — Proc. Am. Acad. x. 47. Mountains of Colorado and Utah.

3. **C. eriocephalus,** Gray. Loosely arachnoid-woolly and partly glabrate, very leafy: *leaves pinnatifid into very numerous and crowded and numerously prickly short lobes, the base decurrent on the stem into prickly wings:* heads several, sessile, and crowded in a leaf-subtended at first nodding glomerule; *the subtending leaves and the involucral bracts densely long-woolly, all very slender-prickly:* corollas light yellow or yellowish. — Alpine region of the Rocky mountains of Colorado.

* * * *Bracts of the involucre moderately unequal or the lower not rarely about equalling the upper, more rigid and imbricated at base, but most of them with*

[1] The naturalized genus *Arctium*, "Burdock," may be known by the hooked tips of its involucral bracts forming a bur, otherwise unarmed; large mostly cordate leaves; and rather small heads of pink or purplish flowers. The species is

A. Lappa, L., and is 3 to 5 feet high, with cymose heads, leaves green and glabrous above but whitish with cottony down beneath, and in the larger forms with the bur an inch or more in diameter, its bracts all spreading and glabrous.

more or less herbaceous spinescent-tipped spreading upper portion, and no glandular dorsal ridge.

4. **C. Eatoni,** Gray. *A foot or so high,* mostly simple, *loosely arachnoid-woolly or glabrate:* leaves pinnatifid or pinnately parted into short lobes, *mostly very prickly,* either green and glabrate, or remaining whitish-woolly beneath: *heads an inch high, few or several and sessile in a terminal cluster: involucre from arachnoid-ciliate to glabrate* or apparently glabrous; its principal bracts *erect,* with broadish appressed base, abruptly attenuate into the subulate-acerose slightly herbaceous spinescent portion, outermost little shorter than the inner: corolla whitish. — Proc. Am. Acad. xix. 56. *Cirsium foliosum* and *C. Drummondii* in part, of the Western Reports. Mountains of Colorado, Utah, and Nevada.

5. **C. Neo-Mexicanus,** Gray. *Stout, 2 to 4 feet high; herbage and commonly squarrose involucre copiously white-woolly:* leaves from sinuate-dentate to pinnatifid, *not very prickly: heads solitary,* terminating the stem or branches, *often 2 inches high and broad:* principal bracts of the involucre with *spinescent rigid tips ½ to 1 inch long:* corolla from white to pale-purple. — Proc. Am. Acad. x. 45. Plains of S. Colorado, New Mexico, and Arizona.

* * * * *Bracts of the involucre regularly and chiefly appressed-imbricated in numerous ranks; the outer successively shorter, not herbaceous-tipped or appendaged.*

+ *Flowers from rose-purple to white: involucre glabrous or early glabrate, the light arachnoid wool caducous; its bracts coriaceous, not at all glandular on the back, outer tipped with a short weak prickle or cusp, innermost wholly unarmed.*

6. **C. Drummondii,** Gray. *Green and somewhat villous-pubescent,* or when young lightly arachnoid-woolly, either stemless and bearing *sessile heads in a cluster on the crown,* or caulescent and even 2 or 3 feet high, *with solitary or several loosely disposed heads: leaves from sinuate or almost entire to pinnately parted, moderately prickly:* larger heads fully 2 inches high: involucral bracts weak-prickly pointed, innermost with more scarious and sometimes obviously dilated and erose-fimbriate tips: corollas either white or sometimes rose-purple. — Proc. Am. Acad. x. 40. From the mountains of Colorado and California to the far north.

Var. **acaulescens,** Gray. Smaller, with heads (solitary or several on the crown, encircled by the radical leaves) only inch and a half long, or less, and proportionally narrow: outer involucral bracts with a longer but rather weak prickle. — Mountains of Colorado to California.

7. **C. scariosus,** Gray. *White with cottony tomentum, at least the lower face of the leaves:* stem about a foot high: *leaves of lanceolate outline, mostly pinnately parted into lanceolate long-prickly lobes;* upper face sometimes villous, sometimes only cottony and early glabrate: *heads 2 or 3 in a sessile cluster, or solitary on short leafy branches:* innermost bracts of involucre commonly with more conspicuous erose or entire scarious tips: corollas pale or white. — Synopt. Fl. i. 402. Mountain plains, Wyoming and Utah.

+ + *Flowers usually rose or flesh-colored: involucral bracts closely appressed, coriaceous, commonly with a glandular or viscid ridge, short line or a broader spot on the back near the summit: heads naked, solitary or scattered.*

= *Leaves pinnately parted into narrow and linear mostly entire divisions.*

8. **C. Pitcheri,** Torr. A foot or two high, with herbage persistently white-tomentose throughout: lower leaves a foot or so long, with divisions either entire or some again pinnately parted into shorter lobes, weakly prickly-tipped; the winged rhachis not wider than the divisions: heads few or solitary, 2 inches high: involucre glabrate; the bracts rather small, viscid down the back, tipped with small short prickle: corollas ochroleucous. — Extending into Dakota and the northeastern limit of our range from the shores of the Great Lakes.

= = *Leaves from undivided to pinnately parted, the lobes lanceolate or broader, disposed to be white-tomentose above as well as below: prickle on cusp of involucral bracts more or less rigid.*

9. **C. ochrocentrus,** Gray. Resembles the next, *usually taller,* even to 6 or 8 feet high, the white tomentum mostly persistent: *leaves commonly but not always deeply pinnatifid and armed with long yellowish prickles:* heads 1 or 2 inches high: principal bracts of the involucre broader and flatter, *the viscid line on the back narrow or not rarely obsolete, tipped with a prominent spreading yellowish prickle:* corollas purple, rarely white. — Proc. Am. Acad. xix. 57. Plains, W. Texas to Colorado and Arizona.

10. **C. undulatus,** Gray. A foot or two high, persistently white-tomentose: *leaves rarely pinnately parted, moderately prickly:* heads commonly 1½ inch high: principal bracts of the involucre mostly thickened on the back by the *broader glandular-viscid ridge,* comparatively small and narrow, *tipped with an evident spreading short prickle:* corollas rose-color, pale purple, or rarely white. — Proc. Am. Acad. x. 42. Plains, from Oregon to the Great Lakes and southward to New Mexico.

Var. **canescens,** Gray, is a form with smaller heads, sometimes not over an inch high, the leaves varying from ciliately spinulose-dentate to deeply pinnatifid. — New Mexico and S. Utah to Minnesota.

= = = *Leaves in the same species from undivided to pinnately parted, the lobes from ovate to lanceolate, upper face soon glabrate and green: involucral bracts tipped with weak prickles or sometimes hardly any.*

11. **C. altissimus,** Willd. Stem branching, 3 to 10 feet high: leaves in the typical form ovate-oblong or narrower, sometimes with merely spinulose-ciliate slightly toothed margins, sometimes laciniate-cleft or sinuate, or lower ones deeply sinuate-pinnatifid, weakly prickly: *heads 1½ to 2 inches high:* involucral bracts *firm-coriaceous, abruptly tipped with a spreading setiform prickle,* the short outermost ovate or oblong: roots fascicled and not rarely tuberous-thickened below the middle, in the manner of *Dahlia.* — East of our range, but represented by

Var. **filipendulus,** Gray. Smaller, 2 or 3 feet high: roots tuberiferous: leaves commonly deeply pinnatifid: heads few, only 1½ inch high. — Proc. Am. Acad. xix. 56. Prairies and thickets, Texas and Colorado.

12. **C. Virginianus,** Pursh. Stem slender, 2 or 3 feet high, simple or branching: leaves narrow, varying as in the last: *heads more naked-peduncu-late, only an inch long:* involucral bracts small and narrow, *thinner, tapering into a very weak short spreading bristle-like prickle, sometimes hardly any:* flowers rose-purple. — From Colorado to Texas and Virginia.

72. KRIGIA, Schreb.

Low herbs; with rather large heads of yellow flowers terminating slender naked peduncles or scapes. Ours belongs to the § *Cynthia,* in which the involucral bracts are 9 to 18 and thin, and pappus of 10 to 15 oblong scales and 15 or 20 slender capillary bristles.

1. **K. amplexicaulis,** Nutt. Caulescent, not tuberiferous, glaucous: stem a foot or two high, 1 to 3-leaved, bearing one or two or few somewhat umbellate heads on moderately long peduncles: leaves oblong or oval, obtuse, entire, repand and denticulate, or radical somewhat lyrately lobed; these contracted into winged petioles; cauline partly clasping by a broad base. — *Cynthia Virginica,* Don. From Colorado to New York and Georgia.

73. STEPHANOMERIA, Nutt.

Mostly smooth and glabrous; with branching or rarely virgate and often rigid or rush-like stems, small or merely scale-like leaves on the flowering branches, and usually paniculate heads of rose-colored or flesh-colored flowers. In ours the heads are ¼ to ½ inch high, mostly 5-flowered and with about the same number of involucral bracts.

* *Perennials, paniculately branched from thick and tortuous roots, with striate and rush-like branches, small-leaved or nearly leafless above: pappus bristles not at all dilated at base, but plumose below the middle.*

1. **S. runcinata,** Nutt. *Comparatively stout* and rigid, a foot or two high, *with spreading branches:* heads mostly 4 or 5 lines high and scattered along the branches: *lower leaves runcinate-pinnatifid,* commonly lanceolate; upper linear or reduced to scales: pappus dull white, plumose only to near the base. — Plains, from Nebraska and Wyoming to Texas, Arizona, and California.

2. **S. minor,** Nutt. *More slender and with ascending branches bearing usu-ally terminal and smaller heads: cauline leaves all slender, often filiform:* pappus white, very plumose down to base. — Plains and mountains, from the borders of British America to those of Mexico.

* * *Annuals or biennials: bristles of the white or whitish pappus plumose above but naked below the middle, at base more or less dilated.*

3. **S. exigua,** Nutt. A foot or two high, with slender branches and branchlets: radical and lower cauline leaves pinnatifid or bipinnatifid, those of the branches mainly reduced to short scales: bristles of the pappus 9 to 18, their more or less dilated or chaffy bases commonly a little connate. — From Wyoming to Texas and westward to Nevada and E. California.

74. MICROSERIS, Don.

Glabrous or merely puberulent, acaulescent or subcaulescent; with heads of yellow flowers terminating naked scapes or elongated simple peduncles.

* *Pappus of* 15 *to* 20 *white and soft plumose bristles with chaffy base: akenes linear-columnar, of same diameter from base to summit: stems more or less branching and leaf-bearing.*

1. **M. nutans,** Gray. Slender, a foot or so high: fusiform roots either fascicled or solitary: leaves from entire and spatulate-obovate to pinnately parted into narrow linear lobes: heads 8 to 20-flowered, slender-peduncled: involucre of 8 to 10 linear-lanceolate gradually acuminate principal bracts: bristles of pappus several times longer than the oblong scale at the base. — Proc. Am. Acad. ix. 208. From British Columbia and Montana to S. W. Colorado and California.

* * *Pappus of* 20 *to* 24 *narrowly linear-lanceolate silvery-white scales, occupying two or more series, very gradually attenuate into a slender awn: akenes attenuate-fusiform.*

2. **M. troximoides,** Gray. Acaulescent or nearly so: leaves tufted on the caudex, rather fleshy, narrowly linear-lanceolate, entire or undulate, 4 to 6 inches long: scapes a span to a foot high: involucre $\frac{3}{4}$ inch high: pappus $\frac{1}{2}$ inch or more long, its almost setiform scales $\frac{1}{4}$ line wide below. — Proc. Am. Acad. ix. 211. Hills and open plains, Montana and Idaho to Washington Territory and California.

75. MALACOTHRIX, DC.

Leafy-stemmed or scapose; with pedunculate heads of yellow or white flowers, sometimes becoming purplish-tinged. In ours the involucre is of narrow bracts and short-peduncled on the leafy spreading branches.

1. **M. sonchoides,** Torr. & Gray. A span to a foot high: lower leaves oblong, pinnatifid, with short and dentate lobes, rhachis of the principal leaves also dentate: akenes linear-oblong, 15-striate-ribbed, somewhat angled by 5 moderately stronger ribs, the summit with a 15-denticulate white border. — Fl. ii. 486. Plains of W. Nebraska to New Mexico and westward.

76. HIERACIUM, Tourn. HAWKWEED.

Perennial herbs: often with toothed but never deeply lobed leaves: heads paniculate, rarely solitary: flowers yellow, or white in one species.

§ 1. *Involucre of the comparatively large heads irregularly more or less imbricated: pappus of copious and unequal bristles: akenes columnar, truncate. In ours the stems are leafy to the top, the cauline leaves all closely sessile.*

1. **H. umbellatum,** L. A foot or two high, strict, bearing a few *somewhat umbellately disposed heads:* leaves narrowly or sometimes broadly lanceolate, *nearly entire, sparsely denticulate,* occasionally laciniate-dentate, *all narrow at base:* involucre usually livid, glabrous or nearly so; outermost bracts loose or spreading. — From Lake Superior to the Rocky Mountains, and northward.

2. **H. Canadense,** Michx. *Taller,* robust, *with corymbosely or paniculately cymose heads:* leaves from lanceolate to ovate-oblong, acute, *sparsely and acutely dentate or even laciniate, at least the upper partly clasping and broad or broadish at base:* involucre usually pubescent when young, glabrate, occasionally glandular; the narrow outermost bracts loose: pappus sordid. — Across the continent near the British boundary and northward.

§ 2. *Involucre a series of equal bracts and a few short ones: pappus of more or less scanty equal bristles: akenes in some species slender or tapering to the summit.*

* *Hirsute with long and whitish or yellowish shaggy denticulate hairs commonly from a small papilla, commonly but not always on the involucre also: flowers yellow.*

3. **H. longipilum,** Torr. Stout, leafy to near the middle of the stem, and with linear-lanceolate or subulate bracts up to the narrow panicle: *pubescence mainly glandular-setose and most abundant,* the bristles upright, commonly ½ to 1 inch long, *fulvous or rufous:* leaves spatulate-oblong or upper lanceolate, thickish, the radical commonly present in a tuft at flowering time: involucre 20 to 30-flowered, and with short peduncles more or less tomentulose as well as glandular, *in a narrow almost virgate panicle: akenes fusiform: pappus at maturity fuscous.* — Woods and prairies, from Nebraska to Texas, within the eastern limit of our range, and eastward to Michigan.

4. **H. Scouleri,** Hook. Robust, a foot or two high: *hairs long and soft setose, whitish or yellowish:* leaves lanceolate or spatulate-lanceolate, 3 to 6 inches long: *panicle irregular or branching:* involucre somewhat furfuraceous and glandular, also sparsely or copiously beset with long bristly hairs: *akenes columnar* and short: *pappus whitish.* — From Montana to Oregon and south to the Wahsatch.

* * *Dark-hirsute and somewhat glandular (also whitish with short tomentum) on the involucre: leaves and lower part of scapiform stems not even pilose: flowers yellow: pappus sordid.*

5. **H gracile,** Hook. Pale green, in tufts: leaves nearly all in radical clusters, obovate- to oblong-spatulate and attenuate into petioles, entire or repand-denticulate: stems or scapes slender, 8 to 18 inches high, cinereous above, bearing few or several racemosely disposed livid heads, the lower linear-bracteate: involucre usually blackish-hairy at base: akenes short columnar. — Includes *H. triste,* mostly, of the Western Reports. Mountains of Colorado, Utah, and northward.

Var. **detonsum,** Gray. A span to nearly a foot high, with rather smaller heads: dark hirsute hairs wholly wanting, or only some smaller ones on the involucre. — Synopt. Fl. i. 427. *H. triste,* var. *detonsum,* Gray. Mountains of Colorado and California to those of British Columbia.

* * * *Not bristly (occasionally scattered bristles on the involucre and panicle), but at least the radical leaves and base of stem sparsely or thickly setose-hirsute with long spreading hairs.*

+ *Flowers white: stems leafy: akenes linear-columnar, not at all narrowed upward: pappus sordid: leaves entire or denticulate.*

6. **H. albiflorum,** Hook. A foot to a yard high, smaller plants with

simple and larger with compound open cyme: leaves oblong, thin, upper with usually narrowed sessile base, lower tapering into petiole: involucre of linear-lanceolate bracts, pale or livid, mostly glabrous or nearly so, not rarely a few bristly hairs. — From Colorado and Utah to California and British Columbia.

+– +– *Flowers yellow: stems rather scapose* (2 *to several-leaved*): *leaves entire or slightly denticulate.*

7. **H. cynoglossoides,** Arvet. Stem a foot or less high (either from naked base or more commonly a radical tuft of leaves), simple, 2 *to several-leaved,* bearing few or several cymosely disposed heads, setose-hirsute or hispid at base: leaves lanceolate to spatulate-oblong, at least the lower *conspicuously setose-hirsute;* upper sometimes glabrous: *involucre glandular,* sometimes as also peduncles glandular-hispidulous: *akenes rather short-columnar: pappus whitish.* — Gray, Proc. Am. Acad. xix. 68. *H. Scouleri,* Hooker, partly. N. W. Wyoming and Montana to Oregon and California.

8. **H. Fendleri,** Schultz Bip. Subscapose, not rarely *one or two leaves toward base* of the simple or paniculately branching stem, sparsely setose-hirsute: radical leaves spatulate or broader; cauline verging to lanceolate, reduced above to linear bracts: heads few and racemiform-paniculate, or more numerous and corymbosely disposed: *involucre puberulent or glabrate,* with or without scattered setose hairs: *akenes tapering from near the base to summit,* sometimes reddish, at length commonly blackish: *pappus copious, soft, sordid-whitish.* — Colorado and New Mexico.

77. CREPIS, L.

Annuals or (ours) perennials, with soft white pappus and narrow-necked or beaked akenes (some truncate or merely tapering upwards): leaves entire or inclined to be pinnatifid: flowers all yellow.

* *Low or depressed, branched from the base, wholly glabrous, bearing numerous clustered heads: involucre of narrowly linear obtuse equal bracts: akenes narrow, 10-striate, having at summit a disk bearing the pappus.*

1. **C. nana,** Richards. *Forming depressed tufts on creeping rootstocks:* leaves chiefly radical, obovate to spatulate, *entire, repand-dentate, or lyrate,* commonly equalling the clustered scapes or stems: heads in fruit nearly ½ inch high: *akenes linear, unequally ribbed, obscurely contracted under the moderately dilated pappiferous disk.* — Alpine mountain summits in Colorado and California, thence far northward.

2. **C. elegans,** Hook. *Many-stemmed from a tap-root,* diffusely branched: *leaves entire or nearly so;* radical spatulate, cauline from lanceolate to linear: heads smaller: *akenes linear-fusiform,* minutely scabrous on the *equal narrow ribs, attenuate into a short slender beak, which is discoid-dilated at summit.* — From Montana and Dakota to the Saskatchewan.

* * *More robust and taller, with scapiform or few-leaved stems and larger heads: akenes thicker, not dilated-discoid at the insertion of the pappus.*

+– *No canescent pubescence: foliage mostly glabrous: involucre many-flowered;*

its bracts narrow, acute, little thickened below after flowering: pappus not remarkably copious: leaves mostly radical.

3. **C glauca,** Torr. & Gray. Usually scapose, 1 to 2 feet high, *glaucescent or glaucous:* radical leaves from obovate-spatulate to lanceolate, *from entire to laciniate-pinnatifid:* involucre 4 lines high, *glabrous or nearly so, as also the peduncles:* akenes oblong, with slightly narrowed summit, strongly and evenly 10-ribbed. — Fl. ii. 438. Moist ground, from the Saskatchewan and Nebraska to Utah and Nevada.

4. **C. runcinata,** Torr. & Gray. *Not glaucous* or slightly so, 1 to 2 feet high: radical leaves obovate-oblong to oblong-lanceolate, *from repand to runcinate-pinnatifid* with short lobes or teeth; cauline none, or small and narrow at the forks: involucre ½ inch high or smaller, *pubescent, often hirsute, sometimes (with peduncles and upper part of scape) glandular-hispidulous:* akenes narrowly oblong, moderately narrowed upward, somewhat evenly 10-ribbed. — Loc. cit. In subalpine swamps, from Colorado and Utah to Montana and the Saskatchewan.

+– +– *Cinereous-pubescent, at least the foliage: bracts of the involucre at length with more or less thickened or keeled midrib, at least at base: leaves usually laciniate-pinnatifid.*

–+ –+ *Principal bracts of the involucre and flowers 5 to 8: no hirsute pubescence: pappus moderately copious and soft.*

5. **C. acuminata,** Nutt. Minutely cinereous below, but green: stem slender, 1 to 3 feet high, 1 to 3-leaved, bearing a fastigiate or corymbiform cyme of *numerous small heads:* leaves elongated, slender-petioled, oblong-lanceolate in outline, laciniate-pinnatifid, tapering to both ends, the apex usually into a lanceolate or linear tail-like prolongation: involucre ⅓ to ½ inch long, rarely over 6-flowered, *smooth and glabrous:* akenes at maturity fusiform, considerably longer than the pappus, *lightly striate-costate,* moderately attenuate at summit. — Dry ground, Montana and Wyoming to E. Oregon, Utah, and California.

6. **C. intermedia,** Gray. Habit and foliage of the preceding, or less tall, more cinereous-puberulent, *usually with fewer heads:* involucre ½ inch or more long, *canescently puberulent;* its bracts in age *more carinate by thickened midrib: akenes acutely 10-costate* at maturity, oblong-fusiform, slightly attenuate upward, longer than or equalling the pappus. — Synopt. Fl. i. 432. *C. acuminata,* Gray, Bot. Calif., partly. Rocky Mountains in Colorado to the Sierra Nevada, California, and north to Washington Territory.

Var. **gracilis,** Gray. A very slender form, with rhachis and apical prolongation as well as lobes of the leaves attenuate-linear. — Loc. cit. *C. occidentalis,* var. *gracilis,* Eaton.

–+ –+ *Principal bracts of involucre 9 to 24 and flowers 10 to 30: pappus exceedingly copious and harsher.*

7. **C. occidentalis,** Nutt. Often hirsute as well as canescent, rather robust, a span to a foot or so high, commonly leafy-stemmed and branching: leaves oblong-lanceolate or broader in outline, variously laciniate-pinnatifid or incised, apex seldom much prolonged: involucre ½ to ⅔ inch high, canescent: akenes longer than the pappus, usually with tapering summit and acute ribs.

— Plains of Nebraska and Wyoming to Washington Territory, and south to the mountains of Colorado and California.

78. PRENANTHES, Vaill.

Perennial herbs, with loosely paniculate heads, few-nerved akenes, and soft bright white pappus. Ours belong to the subgenus *Nabalus*, with more contracted inflorescence, dull-colored flowers, more nerved akenes, and stiffer sordid pappus.

1. **P. racemosa,** Michx. Stems simple, 1 to 5 feet high, leafy up to the inflorescence, with the leaves glabrous and glaucous: *leaves ordinarily only denticulate;* radical and lower leaves *spatulate-oblong to obovate, tapering into winged petioles;* upper cauline lanceolate to ovate, *partly clasping,* the broader ones by a cordate or auriculate base: *heads not at all drooping, crowded in an elongated thyrsus,* a span to 2 feet long: *involucre loosely hirsute:* flowers purplish: akenes about 15-nerved, *somewhat angled* by 4 or 5 of the stronger nerves. — *Nabalus racemosus,* DC. From Colorado to the Saskatchewan, thence eastward across the continent.

2. **P. alata,** Gray. A foot or two high, the larger plants branching: *leaves hastate-deltoid, sharply and irregularly dentate, abruptly contracted* or some of the upper *cuneately decurrent into winged petioles,* or small uppermost narrower and *sessile by a tapering base: heads somewhat pendulous, loosely and somewhat corymbosely paniculate:* involucre of 8 to 10 greenish bracts: flowers purplish: akenes slender, at least sometimes with a tapering summit. — Synopt. Fl. i. 435. *Nabalus alatus,* Hook. From the far north to Oregon, represented in the mountains of N. Montana by

Var. **sagittata,** Gray. Leaves sagittate or hastate, with basal lobes mostly slender and prolonged: heads in a virgate panicle: involucre pale green, very glabrous: immature akenes not tapering to the summit. — Loc. cit.

79. LYGODESMIA, Don.

Mostly smooth and glabrous; with usually rush-like rigid or tough stems, linear or scale-like leaves, and terminal or scattered heads which are always erect: the flowers pink or rose-color.

* *Erect perennials, with striate-angled junciform stems and branches, and terminal solitary heads: akenes slender, terete, almost filiform, slightly tapering to summit: pappus soft and copious, whitish or sordid.*

1. **L. juncea,** Don. *Fastigiately much branched from the deep-rooted base,* about a foot high: leaves persistent, small, somewhat nervose; lower *lanceolate-linear* from a broadish base, *inch or two long;* upper reduced to small subulate scales: involucre at most ½ inch long, 5-flowered: ligules ¼ or ⅓ inch long. — Plains of the Saskatchewan and Minnesota to New Mexico and Nevada.

2. **L. grandiflora,** Torr. & Gray. *Stems separate or few from the root, simple below,* a span to a foot high; the larger plants leafy, corymbosely branched above, and bearing few or numerous short-pedunculate heads: leaves all entire, of firm and thickish texture, *linear-attenuate, 2 to 4 inches long,* only

the very uppermost reduced to scales: involucre fully ¾ inch long, 5 to 10-flowered: *ligules of equal length, showy, rose-red.* — Fl. ii. 485. Gravelly hills, W. Wyoming and Utah.

* * *Paniculately branched annuals: pappus white and soft.*

3. **L. rostrata,** Gray. Stem erect, 1 to 3 feet high, striate, leafy, corymbose-paniculate: leaves narrowly linear, attenuate to both ends, entire, obscurely 3-nerved; cauline 3 to 7 inches long, barely 2 lines wide; uppermost slender-subulate: heads numerous, on scaly-bracteolate erect peduncles: involucre 8 to 9-flowered, of as many very narrowly linear bracts: rays small and narrow, probably purplish: akenes slender-fusiform, distinctly attenuate at summit, longer than the soft rather dull-white pappus. — Proc. Am. Acad. ix. 217. *L. juncea*, var. *rostrata*, Gray. Plains, from the Saskatchewan to Wyoming and Colorado.

80. TROXIMON, Nutt.

Acaulescent or nearly so; with a cluster of sessile or subsessile radical leaves, and simple scapes bearing a head of yellow or rarely purple flowers. Includes both *Troximon* and *Macrorhynchus* of the Western Reports.

§ 1. *Akenes beakless, or tapering gradually into a short and thickish beak, on which the nerves or ribs of the body are prolonged to the apex: pappus somewhat rigid.* — EUTROXIMON.

1. **T. cuspidatum,** Pursh. Glaucescent, somewhat tomentose when young, a span to a foot high: *leaves entire, elongated linear-lanceolate and upwardly linear-attenuate,* mostly ciliate: involucre about an inch high; its bracts in 2 or 3 series, *all tapering to a slender acumination, glabrous: akenes becoming* 3 *or* 4 *lines long, rather shorter than the unequal pappus, beakless.* — Prairies, from Dakota to Wisconsin and W. Illinois. .

2. **T. glaucum,** Nutt. Usually a foot or two high, rather stout, pale or glaucous, either glabrous or with loose pubescence: *leaves linear to lanceolate, from entire to sparingly dentate or sometimes laciniate,* 4 to 12 inches long: involucre commonly an inch high and many-flowered; *its bracts lanceolate or broader;* outer series shorter, *often pubescent or even villous: akenes with the stout nerved beak* 5 *or* 6 *lines long, longer than the pappus.* — *Macrorhynchus glaucus*, Eaton. Grassy plains, Saskatchewan and Dakota to British Columbia, and mountains of Utah and Colorado.

Var. **parviflorum,** Gray. A small and slender form: leaves only 2 to 6 inches long: scape a span to a foot high: head smaller and narrower. — Synopt. Fl. i. 437. *T. parviflorum*, Nutt. Plains of Nebraska and Wyoming to the mountains of New Mexico.

Var. **laciniatum,** Gray. Dwarf (a span or two high), with the small heads of the preceding variety, varying to larger, glabrous or glabrate, when young often cinereous-pubescent throughout: rays sometimes purplish externally or in fading: leaves mostly of lanceolate outline and laciniate-pinnatifid. — Bot. Calif. i. 437. Mountains of Colorado and New Mexico to California.

Var. **dasycephalum,** Torr. & Gray. Commonly robust, with large and broad heads: the involucre inch broad as well as high, and from villous to cinereous-pubescent, sometimes early glabrate: receptacle not rarely bearing

a few chaffy bracts among the flowers: leaves from elongated-lanceolate to oblong-spatulate, from entire to laciniate or rarely pinnatifid: scape from a span to 2 feet high. — Mountains of Colorado to the Sierra Nevada and Washington Territory, northeastward to Dakota and the Arctic regions.

§ 2. *Akenes with a slender and mostly filiform nerveless beak and soft pappus.* — MACRORHYNCHUS.

3. **T. aurantiacum,** Hook. Loosely soft-pubescent and glabrate: leaves from linear-lanceolate to spatulate, thinnish, entire, *or sparingly laciniate-dentate, occasionally pinnatifid:* scape from a span to a foot or more high: involucre 7 to 9 lines high; its bracts from broadly to narrowly lanceolate and acute, or outer and looser ones oblong and obtuse: flowers orange, commonly changing to brownish red or purple: *akenes thickish,* 3 or 4 lines long, and *the firm beak only* 2 *or* 3 *lines long: pappus somewhat rigidulous.* — *Macrorhynchus troximoides,* Torr. & Gray. Northern Rocky Mountains to British Columbia and Oregon, and mountains of Colorado.

Var. **purpureum,** Gray. Leaves apparently thickish, laciniate, and with the purple-tinged involucre very glabrous or glabrate: "flowers purple." — Proc. Am. Acad. xix. 72. New Mexico, and in the mountains of Colorado.

4. **T. gracilens,** Gray. Resembles *slender forms* of preceding: leaves *mostly entire,* flaccid, from lanceolate to nearly linear, or some narrowly spatulate: scape 10 to 18 inches high: head and involucral bracts narrow: flowers deep orange: *akenes fusiform-linear,* 3 or 4 lines long; *the very slender beak* 4 *or* 5 *lines long: pappus soft,* but not flaccid. — Proc. Am. Acad. xix. 71. Mountains in N. Wyoming to Oregon and Washington Territory.

81. TARAXACUM, Haller. DANDELION.

Perennials, sending up in the spring, from a rosulate cluster of runcinate-pinnatifid or lyrate radical leaves, naked fistulous scapes, which elongate with and after the blooming of the showy head of yellow flowers: involucre reflexed at maturity: fruit, with the expanded pappus raised on the elongated beak, displayed in a globose body.

1. **T. officinale,** Weber. Root vertical: leaves from spatulate-oblong to lanceolate, from irregularly dentate to runcinate-pinnatifid: akenes oblong-obovate or narrower, abruptly contracted into a conical or pyramidal apex, which is prolonged into a filiform beak of twice or thrice the length of the akene. In the ordinary form of the fields the involucral bracts are obscurely or not at all corniculate, and the calyculate bracts are linear, elongated, and recurved; leaves usually lobed. — *T. Dens-leonis,* Desf. Common everywhere in fields and yards.

Var. **alpinum,** Koch. Outer involucral bracts ovate to broadly lanceolate, spreading, none conspicuously corniculate. — Labrador to British Columbia, and southward along higher mountains to Colorado and California.

Var. **lividum,** Koch. Outer involucral bracts ovate to ovate-lanceolate, all apt to be dark-colored in drying, obscurely or not at all corniculate: leaves from denticulate to runcinate-dentate, sometimes pinnatifid. — *T. palustre,* DC. Rocky Mountains, from New Mexico to the Arctic coast.

Var. **scopulorum,** Gray. Minute: leaves and scape an inch or less long: head 3 or in fruit even 5 lines high, narrow, few-flowered: outer involucral bracts lanceolate, rather loose; inner somewhat corniculate. — *T. lævigatum,* Gray. Highest alpine region of the Rocky Mountains in Colorado.

82. PYRRHOPAPPUS, DC.

With leafy or (in ours) scapiform stems, undivided or pinnatifid leaves, and rather large slender pedunculate heads of golden yellow flowers. Our species is monocephalous.

1. **P. scaposus,** DC. Hirsutulous-pubescent, low and simple: globular tuber sending up a slender caudex, bearing at the surface of the ground a cluster of pinnatifid leaves and scapes of a span or two high: the latter simple and naked, sometimes a bract or small leaf near the base: head seldom an inch high in fruit: calyculate bracts of involucre short and small, subulate; principal ones obscurely corniculate at tip: flowers citron-yellow: pappus fulvous. — *P. grandiflorus,* Nutt. Prairies of Arkansas to E. Colorado.

83. LACTUCA,[1] Tourn. LETTUCE.

Mostly tall herbs, with milky juice, leafy stems, and paniculate heads of yellow, blue, or whitish flowers: involucre glabrous and smooth. Includes *Mulgedium.*

* *Akenes flat, orbicular to oblong, abruptly produced into a filiform beak of softer texture.*

1. **L. Ludoviciana,** DC. Glabrous, leafy to the open panicle, 2 to 5 feet high: leaves all oblong and *auriculate-clasping,* 3 or 4 inches long, *sinuate-pinnatifid, somewhat spinulosely dentate, more or less bristly-ciliate,* more or less hispidulous-setose on the midrib beneath: *flowers yellow: akenes oblong-oval, about equalled by the filiform beak.* — From Dakota and Wyoming to Iowa and Texas

2. **L. pulchella,** DC. A foot or two high, *very glabrous,* glaucescent, leafy up to the open panicle: leaves from linear-lanceolate to narrowly oblong, *entire or runcinate-dentate,* or some lower ones pinnatifid; cauline sessile, *with*

[1] The Old World genus *Sonchus,* Tourn., ("Sow-Thistle,") with leafy stems, yellow flowers, and white pappus, has become extensively naturalized in the east, and the following species have appeared within our range: —

* Coarse annuals; with runcinately or lyrately pinnatifid leaves, beset with soft spinulose serratures; upper cauline auriculate-clasping: heads corymbose-paniculate: akenes flat, thin-edged, oblong-obovate

S. oleraceus, L., has leaves with soft and hardly spinulose teeth; auricles of the cauline ones acute; akenes striate-nerved and transversely rugulose-scabrous.

S. asper, Vill., has teeth of the leaves longer and more prickly; auricles of the clasping base rounded; and akenes smooth, 3-nerved on each side.

* * Strong-rooted perennial, with deep yellow flowers, and thickish akenes.

S. arvensis, L., has stems 2 feet high and naked at the summit; leaves as before, denticulate-spinulose, cauline partly clasping: peduncles and involucre more or less glandular-bristly; heads almost twice as long (1 inch high); akenes oblong, about 10-ribbed and rugulose on the ribs.

base not auriculate-clasping: flowers bright blue or violet-purple: akenes lanceolate-oblong, barely 2 lines long, striate-nervose; *the tip of short (no longer than the breadth of the body) beak soft and usually whitish.* — *Mulgedium pulchellum*, Nutt. From New Mexico to California, British Columbia, and eastward.

* * *Akenes thickish, oblong, with some strong ribs and nerves, contracted at the summit into a short but manifest neck.*

3. **L. leucophæa,** Gray. Stem 3 to 12 feet high, stout, leafy up to the pyramidal rather crowded panicle: leaves ample, sinuately or runcinately pinnatifid, coarsely and irregularly or doubly dentate; upper cauline sessile by a mostly narrowed but auriculate or partly clasping base: involucre oblong, 5 lines high: flowers bluish to yellowish or whitish: pappus sordid or fuscous. — *Mulgedium leucophæum*, DC. Across the continent from Oregon to the mountains of Carolina and northward.

Order 43. LOBELIACEÆ. (Lobelia Family.)

Herbs with milky juice, alternate leaves, scattered flowers, irregular 5-lobed corolla, and the 5 stamens free from the corolla and united into a tube commonly by their filaments and always by their anthers. Calyx-tube adherent to the 2-celled, many-seeded capsule: style one.

1. **Lobelia.** Corolla open down to the base on one side.
2. **Laurentia.** Corolla with a closed tube. Capsule wholly inferior.

1. LOBELIA, L.

Calyx-tube 5-cleft, with a short tube. Corolla with a straight tube and somewhat 2-lipped; the upper lip of 2 rather erect lobes, the lower lip spreading and 3-cleft. Capsule 2-celled, opening at the top. — Flowers axillary or chiefly in bracted racemes.

1. **L. cardinalis,** L. Stem tall, simple, 2 to 4 feet high, smoothish: leaves oblong-lanceolate, slightly toothed: *raceme* elongated, *rather one-sided: flowers large, deep red;* the pedicels much shorter than the leaf-like bracts. — Colorado, and throughout the States eastward. The intense red of the flower varies to rose-color and even white. Known as "Cardinal Flower."

2. **L. syphilitica,** L. Stems simple, 2 to 3 feet high, leafy to the top, somewhat hairy: leaves thin, oblong or ovate-lanceolate, acute at both ends, irregularly serrate: *flowers in a long spike-like raceme, light blue, rarely white: sinuses of the calyx with deflexed auricles.* — From Colorado to Dakota and throughout the States eastward.

2. LAURENTIA, Micheli.

Calyx-tube turbinate or oblong. Corolla with its tube as long as the limb, which is like that of *Lobelia*. Capsule short, 2-valved at the summit. — Low herbs, resembling small species of *Lobelia*, excepting the closed tube of the corolla. Flowers blue.

1. **L. carnosula,** Benth. Annual, rooting in the mud, glabrous, 1 to 5 inches high: leaves oblong-linear or lanceolate, entire, sessile, ¼ to ½ inch long: flowers axillary and above corymbose or racemose, long-pedicelled. — Gray, Bot. Calif. i. 444. *Porterella carnulosa,* Torr., of Hayd. Rep. 1872, 488. Muddy borders of ponds and streams from the Californian Sierras to Utah and Wyoming.

Order 44. CAMPANULACEÆ. (Campanula Family.)

Like the *Lobeliaceæ,* but the corolla regular bell-shaped, the stamens usually distinct and the capsule (in ours) 3-celled. — Flowers generally blue and showy.

1. **Specularia.** Calyx-tube more or less elongated and narrow. Corolla short and broad, rotate when expanded. Capsule prismatic or elongated.
2. **Campanula.** Calyx-tube short and broad. Corolla generally bell-shaped. Capsule mostly short.

1. SPECULARIA, Heister. Venus's Looking-glass.

Flowers dimorphous; the earlier ones smaller, with undeveloped corolla, and a 3 or 4-lobed calyx. The calyx-lobes of the later corolliferous flowers 5. Capsule with valvular openings either near the summit or near the middle. — Annuals, with leafy slender stems, and sessile flowers. Corolla blue or purplish.

1. **S. leptocarpa,** Gray. Minutely hirsute or nearly glabrous: stems a span or two high, virgate, mostly simple or branched from the base: *leaves lanceolate: capsule nearly cylindrical,* ½ to ¾ inch long, *inclined to curve* and rarely to twist, *opening* by one or two uplifted valves *near the summit; the lowest also often splitting longitudinally from the summit:* seeds oblong. — Proc. Am. Acad. xi. 82. Arkansas to W. Texas and Colorado.

2. **S. perfoliata,** A. DC. Stems 8 to 20 inches high, very leafy throughout, hirsute or hispid on the angles: *leaves round-cordate and clasping,* mostly crenate, veiny: flowers single or clustered in the axils: *capsule oblong* or somewhat obconical; the 2 or 3 valvular *openings at or below the middle; the capsule not disposed to split:* seeds lenticular. — From Colorado to Utah and Oregon, also throughout the States eastward.

2. CAMPANULA, Tourn. Bell-flower, Harebell.

Flowers all alike and corolliferous. Filaments dilated at base. Capsule opening on the sides or near the base by 3 to 5 small uplifted valves or perforations. — Flowers blue or white. Ours have naked sinuses to the calyx.

* *Capsule opening near or at the summit, erect: low and usually* 1*-flowered alpine or subalpine plants.*

1. **C. uniflora,** L. Chiefly glabrous, 1 to 4 inches high, *from a stout several-headed rootstock: leaves* small, an inch or less long, thickish, *entire or nearly so;* the lowest spatulate or oblong, obtuse; uppermost linear: *flowers* 4 *to* 6 *lines in length,* mostly horizontal: calyx-tube nearly as long as the lobes,

which are from half to fully as long as the *deeply campanulate bluish corolla:* capsule cylindraceous or clavate, ½ inch long. — On bare alpine slopes in the Colorado Rocky Mountains, and extending into the arctic regions.

2. **C. planiflora,** Engelm. Glabrous, from a few inches to a span high, *from a filiform rootstock* bearing similar subterranean stolons: *leaves* 1 to 2 inches long, lanceolate to linear-lanceolate, the lowest ones sometimes broader, *all more or less dentate or denticulate: flowers larger,* erect: calyx-lobes several times longer than the tube and exceeding the tube of the *shallow, wide open, reddish-purple corolla:* capsule ovate or turbinate, as long as the calyx-lobes or shorter. — Bot. Gaz. vii. 5. *C. Langsdorffiana* of the Rocky Mountain Floras. *C. Scheuchzeri,* Gray, Fl. N. Am., as to Colorado forms. In subalpine meadows, Colorado. The large shallow corolla is four times wider than deep.

* * *Capsule opening near or at the base: taller, usually several to many-flowered, and in lower ground: rootstocks filiform.*

3. **C. rotundifolia,** L. *Stems* diffuse or erect, a foot or two long, 1 to 9-flowered, *smooth: radical leaves slender-petioled, orbicular or cordate;* cauline leaves linear: *flower-buds erect: calyx-lobes setaceous-subulate: corolla bright blue,* campanulate, ½ *to* 1 *inch long:* capsule nodding. — A subarctic species, ranging southward in the mountains to Mexico.

4. **C. aparinoides,** Pursh. *Stem almost filiform,* a foot or two high, equally leafy to the top, *its sharp angles rough with short retrorse bristles: so also the midrib beneath and the margins of the* lanceolate or linear sessile *leaves: flower-buds drooping: calyx-lobes triangular: corolla pale blue or whitish,* deeply cleft, *the lobes* 2 *lines long or less:* capsule erect. — Wet grassy grounds from Colorado to the Saskatchewan and eastward.

Order 45. ERICACEÆ. (Heath Family.)

Shrubs, sometimes herbs, with the flowers regular or nearly so, the stamens as many or twice as many as the 4 to 5 lobes or petals of the corolla, free or nearly free from it, anthers 2-celled, commonly appendaged or opening by terminal chinks or pores, style one, ovary 3 to 10-celled.

Suborder I. VACCINIEÆ.

Calyx-tube adnate to the ovary, which forms a berry crowned with the calyx-teeth. Corolla always gamopetalous and epigynous. — Shrubby or suffrutescent, with scaly buds and alternate leaves.

1. **Vaccinium.** Ovary 4 to 5-celled, or by false partitions from the back of these cells 8 to 10-celled, wholly inferior: ovules numerous. Anther-cells tapering upward into a tube.

Suborder II. ERICINEÆ.

Calyx free from the ovary. Corolla gamopetalous or rarely polypetalous, hypogynous. — Shrubs or small trees.

* Fruit fleshy, either a berry or drupe.

2. **Arctostaphylos.** Corolla urn-shaped. Stamens twice as many as the corolla lobes, included. Drupe berry-like, 5 to 10-seeded.

* * Fruit a loculicidal capsule, 5-celled and many-seeded. (In ours the calyx becomes fleshy in fruit, enclosing the small capsules, and hence the fruit resembles a berry.)

3. **Gaultheria.** Calyx 5-cleft, its lobes imbricated. Corolla ovate, urn-shaped to campanulate. Stamens 10: filaments dilated towards the base: anthers usually awned. Capsule deeply umbilicate.

* * * Fruit a septicidal capsule: anthers destitute of awns or appendages.

← Corolla gamopetalous: flowers not from scaly buds, the bracts being leaf-like or coriaceous: capsule globular.

4. **Bryanthus.** Corolla from campanulate to ovoid, 4 to 6-lobed. Stamens 8 to 10, straight. Leaves heath-like, alternate but crowded.

5. **Kalmia.** Corolla crateriform or saucer-shaped, 5-lobed, with 10 pouches below the limb. Stamens 10: the short anthers lodged in the corolla pouches in bud, so that in blooming the filaments are strongly recurved. Leaves alternate, opposite, or whorled, flat.

← ← Corolla polypetalous or very nearly so: flowers from large scaly buds, the scales of bracts caducous: capsule oval or oblong.

6. **Ledum.** Calyx 5-lobed or parted, small. Petals oval or obovate, widely spreading. Stamens 5 to 10. Leaves evergreen.

Suborder III. PYROLINEÆ.

Calyx free from the ovary. Corolla polypetalous, hypogynous. Anthers erect and extrorse in bud, with an emarginate or 2-horned base, where each cell opens by a pore; but inverted in anthesis so that the real base with its pores becomes apical. Fruit a loculicidal capsule. — Ours are herbs or nearly so, with broad evergreen leaves and a scape naked or nearly so.

7. **Moneses.** Flowers solitary, 4 or 5-merous. Petals widely spreading, orbicular. Stamens 8 or 10: anthers conspicuously 2-horned. Style straight. Valves of the capsule not woolly on the edges.

8. **Pyrola.** Flowers in a raceme, 5-merous. Petals concave or incurved and more or less converging. Stamens 10, often declined. Style often declined or turned downward. Valves of the capsule cobwebby on the edges.

Suborder IV. MONOTROPEÆ.

Flowers nearly as in Suborders II. and III., but the plants herbaceous, root-parasitic, scaly, entirely destitute of green foliage.

9. **Pterospora.** Corolla gamopetalous, 5-toothed. Anthers 2-celled, 2-awned on the back, opening lengthwise.

10. **Monotropa.** Corolla of 4 or 5 separate narrow petals. Anthers kidney-shaped, the cells more or less confluent, opening across the top.

1. VACCINIUM, L. Blueberry. Bilberry.

Ours all belong to § Euvaccinium, which has a corolla from ovate to globular and more or less urn-shaped, 4 to 5-toothed, rose-color or nearly white: anthers 2-awned on the back, included: ovary and berry 4 to 5-celled, with no false partitions: leaves deciduous: flowers on drooping pedicels, solitary or 2 to 4 together, developing with or soon after the leaves.

* *Flowers solitary or 2 to 4 in a fascicle, from a distinct scaly bud, more commonly 4-merous and 8-androus: leaves entire, sessile or nearly so: limb of the calyx deeply 4 to 5-parted: berries blackish-blue with a bloom.*

1. **V. occidentale,** Gray. A foot or more high, glabrous: leaves glaucescent, obscurely veiny, from oval to obovate-oblong or oblanceolate, obtuse or acutish: flower mostly solitary from the scaly bud: berry small, barely 3 lines in diameter. — Bot. Calif. i. 451. In the Uinta Mountains and westward in the Sierra Nevada.

* * *Flowers solitary in the earliest axils, usually 5-merous and 10-androus: calyx less or very slightly lobed.*

+ *Dwarf and cespitose: branches not angled.*

2. **V. cæspitosum,** Michx. Glabrous or nearly so, 3 to 6 inches high: leaves from obovate to cuneate-oblong, thickly serrulate, bright green both sides, reticulate-veiny (⅜ to 1 inch long): berry proportionally large, blue with a bloom, sweet. — From the Colorado mountains to Alaska, and eastward in Labrador and the White Mountains.

Var. **cuneifolium,** Nutt. A span to near a foot high, bushy: leaves spatulate-cuneate and with rounded apex, passing in one form to spatulate-lanceolate and acute; the earliest not rarely entire. — Mountains of Colorado to California, British Columbia, and Lake Superior.

+ + *Low: branches sharply angled and green: leaves small.*

3. **V. Myrtillus,** L. A foot or less high, glabrous: leaves ovate or oval, thin, shining, serrate, conspicuously reticulated-veiny, and with a prominent narrow midrib (½ to ⅝ inch long): limb of calyx almost entire: corolla globular-ovate: berries black, nodding. — From Colorado and Utah northward to Alaska. Known as "Whortleberry" or "Bilberry."

Var. **microphyllum,** Hook. A diminutive form, 3 to 6 inches high: leaves 2 to 4 lines long: corolla proportionally small, a line long: berries at first "light red." — Colorado, Utah, and in the Sierras and northward.

2. ARCTOSTAPHYLOS, Adans. Bearberry. Manzanita.

Shrubs with alternate leaves, and small mostly white or rose-colored flowers variously clustered.

1. **A. Uva-ursi,** Spreng. Depressed-trailing or creeping, green: leaves coriaceous and evergreen, oblong-spatulate, retuse, an inch or less long, tapering into a petiole: flowers rather few in simple small clusters, 2 lines long: ovary and reddish fruit glabrous: nutlets 1-nerved on the back. — From New Mexico to Pennsylvania, California, and northward. Often called "Kinnikinnick," as well as "Bearberry."

3. GAULTHERIA, Kalm. Aromatic Wintergreen.

Shrubs or almost herbaceous; with broad evergreen leaves, shining above, and usually spicy-aromatic in flavor, axillary white or rose-colored nodding flowers in early summer.

1. **G. Myrsinites,** Hook. Cespitose-procumbent or depressed, a few inches high: leaves orbicular or ovate, denticulate with minute bristle-tipped

teeth (½ to 1½ inches long): pedicels solitary in the axils, very short: corolla depressed-campanulate, little exceeding the calyx: apex of anthers obscurely 4-pointed: fruit scarlet, with pine-apple flavor. — In the mountains from Colorado and Utah to British America and westward.

4. BRYANTHUS, Steller, Gmelin.

Heath-like alpine evergreens; with much crowded linear-obtuse leaves (½ inch or less long). In ours the flowers are racemose-clustered at the summit of the branches, the pedicels glandular and subtended by foliaceous and rigid bracts, and the almost smooth leaves have strongly revolute thickened margins.

1. **B. empetriformis,** Gray. A span or more high: pedicels somewhat umbellate: corolla rose-color, 2 or 3 lines long, campanulate, barely 5-lobed; the lobes much shorter than the tube: stamens included: style either included or exserted. — Proc. Am. Acad. vii. 377. Mountains of W. Wyoming, Montana, and northwestward.

5. KALMIA, L. American Laurel.

Leaves evergreen and entire: the showy flowers umbellate-clustered, rose-colored, purple or white: limb of the corolla in bud strongly 10-keeled from the pouches upward, the salient keels running to the apex of the lobes and to the sinuses.

1. **K. glauca,** Ait. Shrub 1 or 2 feet high, glabrous, mostly glaucous, branchlets 2-edged: leaves all opposite or rarely in threes, almost sessile, oblong or linear-oblong, or appearing narrower by the usual strong revolution of the edges, glaucous-white beneath: flowers in spring in a simple terminal umbel or corymb, lilac-purple, ½ to ⅔ inch in diameter. — Bogs, Colorado and northward, thence eastward across the continent. The forms extending southward into the Colorado mountains are depauperate alpine forms a span high and with leaves barely ½ inch long (var. *microphylla,* Hook.).

6. LEDUM, L. Labrador Tea.

Low shrubs, with alternate persistent leaves, which are entire and more or less resinous-dotted, slightly fragrant when bruised: flowers white, developed in early summer from terminal or sometimes lateral buds; pedicels recurved in fruit.

1. **L. glandulosum,** Nutt. Shrub 2 to 6 feet high, stout: leaves oblong or oval, or approaching lanceolate (1 or 2 inches long), glabrous both sides, pale or whitish and minutely resinous-atomiferous beneath: inflorescence often compound and crowded: capsules oval, retuse. — From California northward and eastward into British America, occurring in the northwestern border of our range.

7. MONESES, Salisb.

Cells of the anther oblong, abruptly constricted under the orifice into a conspicuous short-tubular neck.

1. **M. uniflora,** Gray. Herb with 1-flowered scape 2 to 4 inches high, a cluster of roundish and serrulate thin leaves at base, on a short stem or the ascending summit of a filiform rootstock: corolla white or tinged with rose-color, about ⅔ inch in diameter. — Deep moist woods, Colorado and Utah to Oregon, Pennsylvania, and northward.

8. PYROLA, Tourn. Wintergreen. Shin-leaf.

Acaulescent evergreens; with a cluster of round or roundish leaves, and some scarious scales on the ascending summit of slender subterranean rootstocks: scape more or less scaly-bracted, bearing a raceme of white, greenish, or purplish nodding flowers, in summer.

* *Style straight, much narrower than the expanded depressed 5-rayed stigma: anthers not narrowed below the openings.*

1. **P. minor,** L. *Leaves orbicular,* thinnish, obscurely serrulate or crenulate, an inch or less long: scape a span high, 7 to 15-flowered: *petals white or flesh-colored, orbicular, naked at the base,* globose-connivent: stigma peltate, large, obscurely 5-lobed: *hypogynous disk none.* — Mountains from New Mexico to Oregon and northward, thence eastward across the continent.

2. **P. secunda,** L. Inclined to be caulescent from a branching base: *leaves* thin, *ovate,* serrulate or crenate, 1 or 2 inches long: scape a span long, bearing numerous *flowers in a secund spike-like raceme: petals greenish white, oblong, each with a pair of tubercles on the base,* equally connivent: stigma peltate, large, 5-lobed: *hypogynous disk* 10-*lobed.* — Mountains of Colorado, California, and far northward and eastward.

* * *Style strongly declined or decurved and toward the apex more or less curved upward, longer than the concave somewhat campanulate-connivent or partly spreading petals: stigma much narrower than the truncate and usually excavated apex of the style, which forms a ring or collar: anthers more or less contracted under the terminal orifices.*

3. **P. chlorantha,** Swartz. *Leaves* small (½ to 1 inch in diameter), *orbicular or nearly so, coriaceous,* not shining, *shorter than the petiole:* scape 4 to 8 inches high, 3 to 10-flowered: *calyx-lobes very short and obtuse or rounded,* appressed to the *greenish-white corolla:* anther-cells with distinctly beaked tips. — Mountains of Colorado, northward and eastward.

4. **P. elliptica,** Nutt. *Leaves oval or broadly oblong,* 1½ to 2½ inches long, *membranaceous, acute or merely roundish at base, longer than their petioles, plicately serrulate:* scape a span or more high, loosely several to many-flowered: *calyx-lobes ovate and acute,* short: *corolla greenish white: anther-tips hardly at all beaked.* — Mountains of New Mexico to British Columbia, the N. Atlantic States, and Canada.

5. **P. rotundifolia,** L. *Leaves generally orbicular or broadly oval,* 1½ to 2 inches long, *obscurely crenulate or entire, coriaceous, shining above, mostly shorter than the slender petioles:* scape a span to a foot high, several to many-flowered, scaly-bracteate: *calyx-lobes lanceolate to ovate-lanceolate,* usually ½ or ⅓ the length of the *white or flesh-colored petals.* — Dry woods, from California, New Mexico, and Georgia, northward to the arctic regions.

Var. **uliginosa,** Gray. *Calyx-lobes shorter, usually broadly ovate,* sometimes obtuse · *leaves from subcordate to obovate, generally dull:* flowers rose-colored or purple. — Cold bogs, nearly across the continent to the north.

6. **P. picta,** Smith. *Leaves firm-coriaceous, dull, commonly veined or blotched with white above, pale or sometimes purplish beneath,* 1 to 2½ inches long, *from broadly ovate to spatulate or narrowly oblong, all longer than the petiole, the margins quite entire* or rarely remotely denticulate: scapes a span or more high, 7 to 15-flowered: bracts few and short: *calyx-lobes ovate,* not half the length of the greenish-white petals. — Wyoming and S. Utah to California and northward.

9. PTEROSPORA, Nutt. Pine-drops.

Calyx deeply 5-parted. Corolla globular urn-shaped. Stamens 10, included. Disk none. Stigma 5-lobed. Capsule depressed-globular, 5-lobed. Seeds innumerable, broadly winged from the apex.

1. **P. andromedea,** Nutt. A chestnut-colored or purplish herb, glandular and clammy-pubescent: simple stem 1 to 3 feet high, bearing small and scattered lanceolate scales: raceme long and many-flowered: corolla white, ¼ inch long, somewhat viscid. — Under pines and oaks from Colorado to California northward, and eastward across the continent.

10. MONOTROPA, L. Indian Pipe. Pine-sap.

Sepals of 2 to 5 lanceolate bract-like scales. Petals scale-like and fleshy, gibbous or saccate at base. Stamens 8 to 12. Disk 8 to 12-toothed, the teeth deflexed. Stigma funnelform, with obscurely crenate margin. Capsule ovoid. — White, tawny, or reddish scaly and fleshy herbs, the clustered stems rising from a thick and matted mass of fibrous rootlets, one to several-flowered.

* *Plant inodorous, one-flowered: scales passing into an imperfect or irregular calyx of 2 to 4 loose sepals or perhaps bracts: anthers opening at first by 2 transverse chinks, at length 2-valved; the valves almost equal and equally spreading: edge of the stigma naked.*

1. **M. uniflora,** L. Smooth, a span or so high, waxy-white (blackish in drying), rarely flesh color: flower nodding, ⅔ inch long: petals 5, rarely 6. — Damp woods, nearly throughout the continent. "Indian Pipe."

* * *Plant often scented, commonly pubescent, at least above, racemosely 3 to several-flowered: terminal flower earliest and usually 5-merous and the lateral 3 to 4-merous: sepals less bract-like, as many as the petals; the latter saccate at base: anthers more reniform; the cells completely confluent into one, which opens by very unequal valves, the larger broad and spreading, the other remaining erect and contracted: stigma glandular or hairy on the margin.*

2. **M. Hypopitys,** L. A span or at length a foot high, tawny or flesh-colored: scales and bracts entire or slightly erose: flowers less than ½ inch long; the lateral 4-petalous and 8-androus. — Under coniferous trees from Oregon to Canada and Florida. "Pine-sap."

Order 46. **PRIMULACEÆ.** (Primrose Family.)

Herbs with simple leaves and regular perfect flowers, the stamens as many as the lobes of the gamopetalous corolla and inserted opposite them, a one-celled ovary with a free central placenta rising from the base, bearing several or many seeds. Style and stigma one.

* Ovary wholly free.

+ With scapes or tufted: flowers chiefly 5-merous, umbellate or solitary: capsule dehiscent by valves: lobes of the corolla imbricated in the bud.

++ Stamens exserted, connivent in a cone, monadelphous.

1. **Dodecatheon.** Corolla 5-parted, with very short tube and dilated thickened throat, the long and narrow divisions reflexed. Stamens inserted on the throat of the corolla: anthers lanceolate or linear.

++ ++ Stamens included, distinct, with short filaments and short blunt anthers: corolla salverform or funnelform.

2. **Primula.** Corolla with tube surpassing or at least equalling the calyx, and spreading mostly obcordate or emarginate lobes. Capsule many-seeded. Leaves all radical.
3. **Douglasia.** Corolla with tube equalling or surpassing the calyx, somewhat inflated above; lobes entire. Ovary 5-ovuled. Capsule 1 or 2-seeded. Leaves imbricated or crowded on tufted stems.
4. **Androsace.** Corolla with tube shorter than the calyx; the throat constricted. Ovules and seeds numerous or few. Flowers small.

+ + Leafy-stemmed: corolla (wanting in *Glaux*) rotate or somewhat so, and the divisions convolute or sometimes involute in the bud: leaves entire.

++ Capsule dehiscent vertically by valves or irregularly, mostly globose: flowers 5-merous.

5. **Steironema.** Corolla rotate, with no proper tube, deeply parted the divisions ovate, cuspidate-pointed, erose-denticulate above, each separately involute or convolute around its stamen. Filaments distinct or nearly so on the ring at the base of the corolla: anthers linear and arcuate in age: sterile filaments 5, interposed between the fertile ones. Capsule 10 to 20-seeded. Flowers nodding on slender peduncles. Leaves opposite, without dots.
6. **Glaux.** Corolla none. Calyx with 5 petaloid lobes. Stamens on the base of the calyx, alternate with its lobes: filaments slender: anthers cordate-ovate. Capsule 5-valved at apex, few-seeded. Leafy throughout: leaves mainly opposite. Flowers solitary, axillary, nearly sessile.

++ ++ Capsule circumscissile, globose: seeds numerous.

7. **Centunculus.** Corolla with a globular tube and a 4 to 5-lobed limb, shorter than the calyx; lobes acute. Stamens on the tube of the corolla: filaments short and subulate: anthers ovate or cordate.

* * Ovary connate at base with the calyx.

8. **Samolus.** Flowers 5-merous. Corolla perigynous, nearly campanulate. Fertile stamens 5, on the tube of the corolla, with short filaments and cordate anthers. Sterile filaments 5 in the sinuses of the corolla. Capsule ovate or globular, 5-valved at the apex, many-seeded. Caulescent, alternate-leaved, with racemose flowers.

1. DODECATHEON, L. Shooting-Star. American Cowslip.

Flowers few or numerous in an umbel terminating a naked scape: corolla from pink-purple to white. Calyx erect in fruit, enclosing the lower part of the capsule.

1. **D. Meadia,** L. Leaves crowded on a thickish crown, generally spatulate-oblong or oblanceolate and entire or nearly so, sometimes repand, obtuse, below tapering into a more or less margined petiole: scape from a span to 2 feet high: flowers few to many in an umbel; bracts of the involucre linear or subulate, small; pedicels slender and nodding with the flowers, erect in fruit. — Throughout the continent and exceedingly variable, especially westward.

Var. **alpinum,** Gray. Leaves oblanceolate or spatulate, ½ to 1½ inch long, entire, mucronate: scape 2 to 10 inches long, 1 to 4-flowered. — Synopt. Fl. ii. 57. From the Rocky Mountains to the Sierras.

Var. **frigidum,** Gray. Leaves from obovate to oblong, very obtuse, mostly entire, 1 to 2 inches long, with a slender petiole: scape a span or two high, few to several-flowered: lobes of the calyx longer than the tube, from broadly lanceolate to almost ovate, shorter than the capsule. — Synopt. Fl. ii. 57. Rocky Mountains, Sierras, and far northward.

Var. **latilobum,** Gray. Leaves thin, ovate or oval, repand or undulate-toothed, long-petioled: scape a span to a foot high, one to several-flowered: calyx-lobes not longer than the tube, ovate or triangular-ovate, about half the length of the capsule. — Synopt. Fl. ii. 58. Wahsatch Mountains to Washington and British Columbia.

2. PRIMULA, L. Primrose.

Flowers sometimes dimorphous. Perennial plants, mostly with fibrous roots from a short crown, glabrous or nearly so.

* *Flowers small; tube of the salverform corolla not over 2 or 3 lines long and little surpassing the calyx; throat with more or less of a callous ring or processes.*

1. **P. farinosa,** L. More or less white mealy on the leaves, calyx, etc., at least when young: leaves from cuneate-lanceolate to obovate-oblong or spatulate, denticulate, an inch or less long, tapering into a short margined petiole: scape 3 to 9 inches high: umbel few to several-flowered, close: corolla from flesh-color to lilac, with yellowish eye; the lobes cuneate-obcordate, rather distant at base. — From Colorado northward, thence eastward to Maine and Labrador.

* * *Flowers larger; tube of the corolla from 3 to 6 lines long; throat open and unappendaged: leaves clustered on the short erect subterranean crown.*

2. **P. angustifolia,** Torr. *Small: scape 1-flowered, 1 or 2 inches high,* equalling the *lanceolate-spatulate obtuse entire* short-petioled *leaves:* involucre of 1 or 2 minute bracts: lobes of the *lilac-purple corolla* obovate, emarginate (3 or 4 lines long); the tube hardly exceeding the narrow teeth of the oblong calyx. — Ann. Lyc. N. Y. i. 34. Alpine in Colorado and New Mexico.

3. **P. Parryi,** Gray. *Large: leaves* rather succulent, *spatulate-oblong or oblanceolate,* 4 *to* 12 *inches long, often denticulate: scape a span to a foot high,* 5 *to* 12-*flowered:* bracts of the involucre subulate: *calyx* ovoid-campanulate, *glandular, commonly reddish;* the lanceolate-subulate lobes as long as the tube: *corolla crimson-purple with yellow eye;* the round obovate lobes (5 lines long) emarginate or obcordate. — Amer. Jour. Sci. II. xxxiv. 257. Along alpine brooks from Colorado to Arizona and Nevada.

3. DOUGLASIA, Lindl.

Depressed and tufted herbs: the stems branching, persistent: the leaves small, linear, imbricated or rosulate on the branches, or some of them scattered and alternate. In ours the flowers are solitary, terminating the leafy shoots, and the tube of the corolla barely equals the calyx.

1. **D. montana**, Gray. Pulvinate-cespitose, 1 or 2 inches high, nearly glabrous: leaves subulate, minutely somewhat ciliate, 2 lines long, somewhat interruptedly imbricate-clustered: pedicel 1 to 2-bracteolate near the calyx: corolla-lobes cuneate-obovate, 2 lines long. — Proc. Am. Acad. vii. 371. Mountains about Helena, Montana, and Owl Creek Mountains, Wyoming.

4. ANDROSACE, Tourn.

Small annuals or perennials of various habit: flowers umbellate, white.

* *Perennials, proliferously branched at base and cespitose: leaves rosulate-imbricated at the base of the many-flowered scapes: capsule usually few-seeded.*

1. **A. Chamæjasme,** Host. Leaves in more or less open rosulate tufts, from lanceolate to oblong-spatulate or ovate, carinate 1-nerved, their margins (at least), the scape (1 to 3 inches high) and the somewhat capitate umbel villous with many-jointed hairs: corolla white with yellowish eye. — Alpine from Colorado and northward to the Arctic coast.

* * *Annuals, acaulescent, with slender root, an open rosulate circle of leaves, and naked scapes, bearing an involucrate umbel: capsule many-seeded.*

+ *Calyx-tube obpyramidal in fruit, whitish with conspicuous green teeth, which mostly surpass the capsule.*

2. **A. occidentalis,** Pursh. *Minutely pubescent, not over 3 inches high:* radical *leaves* and those of the *conspicuous involucre oblong-ovate or spatulate, entire, sessile:* scapes diffuse: *bracts of the involucre ovate or oblong:* lobes of the calyx as long as the tube: lobes of the corolla oblong, shorter than the calyx. — From New Mexico to the head-waters of the Missouri and eastward to the Mississippi.

3. **A. septentrionalis,** L. *Almost glabrous: leaves lanceolate or oblong-lanceolate, narrowed at base, from irregularly denticulate to laciniate-toothed: scapes erect, 2 to 10 inches high: bracts of the small involucre subulate:* lobes of the calyx mostly shorter than the tube: lobes of the corolla obovate, rather longer than the calyx. — High alpine to much lower, from New Mexico and Nevada to the Arctic coast.

Var. **subulifera,** Gray. *Lobes of the calyx slender-subulate,* as long as the tube, surpassing the corolla. — Synopt. Fl. ii. 60. Mountains near Boulder City, Colorado, and San Bernardino, California.

+ + *Calyx-tube hemispherical in fruit; the short teeth barely greenish and rather shorter than the capsule.*

4. **A. filiformis,** Retz. Glabrous: leaves and scapes (1 to 4 inches high) nearly as in the preceding or more capillary: flowers less than a line and globose capsule only a line long: calyx-teeth broadly triangular, shorter than the very small corolla. — Mountains from Colorado and Utah to Wyoming.

5. STEIRONEMA, Raf.

Perennials, glabrous except the ciliate petioles: leaves all opposite, but mostly in seeming whorls on the flowering branches: flowers yellow.

1. **S. ciliatum,** Raf. Stem erect, 2 to 4 feet high, mostly simple: *leaves ovate-lanceolate or oblong-ovate,* gradually acuminate, 2 *to* 5 *inches long, and mostly with a rounded or subcordate base,* minutely ciliate; *the long petioles hirsutely ciliate.* — Gray, Proc. Am. Acad. xii. 62. *Lysimachia ciliata,* L. New Mexico to British Columbia and eastward across the continent.

2. **S. lanceolatum,** Gray. Stem erect, 1 to 2 feet high, simple or paniculately branched, somewhat angled: *leaves lanceolate or linear,* 1 *to* 2 *inches long, tapering into a short and margined ciliate petiole or attenuated base;* the radical and sometimes lowest cauline from oblong to orbicular, small: divisions of the corolla conspicuously erose and cuspidate-acuminate. — Proc. Am. Acad. xii. 62. *Lysimachia lanceolata,* Walt. Dakota and Nebraska to Louisiana and eastward.

Var. **hybridum,** Gray. Cauline leaves mostly petioled, from oblong to broadly linear. — Synopt. Fl. ii. 62. The commoner form westward.

6. GLAUX, Tourn. Sea-Milkwort.

Flowers dimorphous. A low and leafy fleshy perennial.

1. **G. maritima,** L. Glabrous and glaucous or pale, perennial by slender running rootstocks: stems a span or less high, erect or spreading: leaves from oval to oblong-linear, ¼ to ½ inch long, entire, sessile: calyx-lobes oval, purplish or white. — Salt marshes along both sea-coasts; also in subsaline soil in the interior west of the Mississippi.

7. CENTUNCULUS, Dill. Chaffweed.

Very small glabrous annuals, with mainly alternate leaves, and solitary inconspicuous flowers in their axils.

1. **C. minimus,** L. Stems ascending, 2 to 6 inches long: leaves ovate, obovate, or spatulate-oblong, contracted or tapering at base, all but the lowest sessile: calyx-lobes lanceolate-subulate. — From Illinois to Texas and westward to Oregon.

8. SAMOLUS, Tourn. Brookweed. Water Pimpernel.

Low and glabrous herbs; with entire leaves, and small white flowers in simple or panicled racemes.

1. **S. Valerandi,** L., var. **Americanus,** Gray. Stem erect, slender, leafy, becoming diffusely branched: leaves obovate: racemes often panicled; bracts none; bractlets on the middle of the slender, spreading pedicels. — Wet places, across the continent.

Order 47. **OLEACEÆ.** (Olive Family.)

Trees or shrubs, rarely almost herbaceous, with mostly opposite and pinnate or simple leaves, usually a 4-cleft (or sometimes obsolete) calyx, a regular 4-cleft or nearly or quite 4-petalous corolla, sometimes apetalous; the stamens generally 2, rarely 3 or 4; the ovary 2-celled, with one or two pairs of ovules in each cell.

* Fruit entire, dry, indehiscent, winged (a samara): seed suspended: leaves pinnate.

1. **Fraxinus.** Flowers diœcious or polygamous, sometimes perfect. Calyx very small, 4-cleft or irregularly toothed, or entire, or wanting. Petals none, or 4 and either separate or united in pairs at the very base. Fruit by abortion mostly 1-celled and 1-seeded; the wing mainly terminal.

* * Fruit fleshy and indehiscent (a drupe), not lobed: seed suspended or pendulous: leaves simple.

2. **Forestiera.** Flowers apetalous, diœcious or polygamous. Calyx minute, 4-parted or toothed, sometimes wanting. Drupe 1-seeded.

* * * Fruit a didymous or 2-parted at length membranaceous capsule, circumscissile at or near the middle: seeds ascending or erect: leaves mostly alternate and entire.

3. **Menodora.** Calyx 5 to 15-cleft, persistent; the lobes mostly linear. Corolla from rotate to salverform; limb 5 to 6-parted. Ovary emarginate, with 4 ovules in each cell. Seeds usually a pair in each cell, large, with a thickened and spongy outer coat.

1. FRAXINUS, Tourn. Ash.

Trees, with rather light tough wood, petioled odd-pinnate leaves of 3 to 15 toothed or entire leaflets, and small flowers in crowded panicles, which in ours are from the axils of last year's leaves. The oblong seed fills the cell of the samara or key-fruit. Ours are apetalous and diœcious, with a minute calyx or none, and the fruit winged only from the summit or upper part of the terete body, which tapers gradually from summit to base and is more or less margined upward by the decurrent wing.

1. **F. pubescens,** Lam. (Red Ash.) Tree of middle or large size: inner face of the outer bark of the branches red or cinnamon-color when fresh: *young parts velvety-pubescent,* commonly permanently so: *leaflets* 7 to 9, from ovate to oblong-lanceolate, mostly acuminate, entire or sparsely serrate or denticulate, *the lower face pale or whitish, and with the petioles more or less pubescent:* fruit 1½ to 2 inches long; its body more than half the length of the linear or spatulate wing. — From Dakota to Canada and southward; quite rare within our range.

2. **F. viridis,** Michx. f. (Green Ash.) Small or middle-sized tree, *glabrous:* leaflets 5 to 9, like the last, but smaller, sometimes more sharply serrate and *bright green both sides,* or barely pale beneath: fruit nearly as in the last or with a rather more decurrent wing. — From Dakota and Canada to Florida and Texas.

2. FORESTIERA, Poir.

Shrubs, with inconspicuous flowers, in early spring, from imbricated-scaly axillary buds, and small dark-colored drupes. Fascicles or panicles very

short, few-flowered; the staminate sessile and in a sessile globular scaly glomerule. Branches minutely warty.

1. **F. Neo-Mexicana,** Gray. Shrub 6 to 10 feet high, glabrous: leaves spatulate-oblong, obtuse or obtusely acuminate, short-petioled, obtusely or obsoletely serrulate, an inch long: fertile flowers in sessile fascicles: drupe obtuse, short-oblong or ovoid. — Proc. Am. Acad. xii. 63. S. Colorado to New Mexico and Texas.

3. MENODORA, Humb. & Bonpl.

Low shrubby or nearly herbaceous plants, with conspicuous yellow flowers terminating the branches, or becoming lateral. In ours the corolla is nearly rotate, with a bearded throat.

1. **M. scabra,** Gray. Herbaceous from a woody branching base, a span to a foot high, flax-like, whole herbage or at least the lower part puberulent-scabrous: leaves linear or the lower oblong, chiefly entire, 4 to 10 lines long: flowers rather numerous: calyx-lobes 7 to 15, slender, linear or subulate: lobes of the bright yellow corolla obovate, much longer than the tube. — Am. Jour. ci. II. xiv. 43. W. Texas to S. Colorado and Arizona.

Order 48. APOCYNACEÆ. (Dogbane Family.)

Plants with milky or acrid juice, entire (mostly opposite) leaves, regular 5-merous and 5-androus flowers, the lobes of the corolla convolute and twisted in the bud, and the filaments distinct and inserted on the corolla. In ours the anther-cells are produced into a sterile appendage at base, connivent around the stigma and adherent to it by a point at the base of the polliniferous portion; the ovaries are 2 and united only by the common style or stigma, in fruit becoming follicles containing comose seeds.

1. APOCYNUM, Tourn. Dogbane. Indian Hemp.

Calyx small, deeply 5-cleft, the tube by means of a thickish disk adnate to the back of the ovaries below. Corolla campanulate, 5-lobed, toward the base bearing 5 small triangular-subulate appendages alternate with the stamens. Filaments very short and broad: anthers sagittate. Follicles slender, terete. Seeds numerous, with a long coma at apex. — Pale perennial herbs, with very tough-fibrous bark and opposite mucronate-tipped leaves: flowers small, in terminal cymes, white or rose-color: follicles 2 to 7 inches long.

1. **A. androsæmifolium,** L. One to three feet high, glabrous, or rarely soft-tomentose, branched above; *branches widely spreading: leaves ovate or roundish, distinctly petioled:* cymes loose, spreading: *corolla* flesh-color, open-campanulate *with revolute lobes; the tube exceeding the ovate acute calyx-lobes.* — Across the continent.

2. **A. cannabinum,** L. Erect or ascending, glabrous or sometimes soft-pubescent: *branches ascending,* leafy to the top: *leaves from oval to oblong*

and even lanceolate, from short-petioled to sessile, with a rounded or obscurely cordate base: cymes erect, densely flowered: *corolla* greenish-white or slightly flesh-color, smaller than in the former, *with almost erect lobes and tube not longer than the lanceolate calyx-lobes.* — Same range as last. Exceedingly variable.

Order 49. **ASCLEPIADACEÆ.** (Milkweed Family.)

Plants with milky juice, and opposite or whorled (rarely scattered) entire leaves; general structure of flowers and fruit as in *Apocynaceæ;* but differing in the connection of the anthers with the stigma, the cohesion of the pollen into wax-like or granular masses, etc. A corona (*crown*), of 5 parts or lobes, between the corolla and filaments, is adnate either to the one or the other. The tube of monadelphous filaments is called the *column.* Ours all belong to the *Cynancheæ*, which have anthers tipped with an inflexed or sometimes erect scarious membrane; the polliniferous cells lower than the top of the stigma; and the pollinia suspended, attached in pairs (one of each adjacent cell of different anthers) to the corpuscle or gland.

* Hoods (the cucullate or hollowed nectariferous appendages of the crown) cristate- or corniculate-appendaged within.

1. **Asclepiodora.** Corolla rotate-spreading in anthesis. Hoods basilar, inserted over the whole very short column, spreading and arcuate-assurgent, little surpassing the anthers, slipper-shaped and the rounded apex fornicate, hollow and with a thickish fleshy back, traversed by a salient crest which near the apex divides the cavity. Anther-wings narrowed at base, angulate above the middle if at all. Leaves commonly alternate.

2. **Asclepias.** Corolla almost always reflexed in anthesis. Hoods involute or complicate, not fornicate, bearing a horn or crest-like process from the back or toward the base within, either sessile next the corolla or elevated on a column which is shorter than the anthers. Anther-wings widening down to the base, usually triangular, the salient base being truncate or semi-hastate, or broadly rounded. Leaves opposite or varying to alternate or verticillate.

* * Hoods wholly destitute of crest or appendage within.

3. **Acerates.** Hoods involute-concave or somewhat pitcher-shaped. Anther-wings widened or angulate if at all near or above the middle, thence narrowed to the base. Otherwise as *Asclepias.* Leaves alternate or scattered.

1. ASCLEPIODORA, Gray.

Low and stout perennial herbs, often decumbent: flowers large: corolla lobes ovate, greenish: follicles usually bearing some scattered soft-spinulose projections, on recurved or sigmoid pedicels. Distinguished from *Asclepias* by the hood bearing a crest instead of a horn. — Proc. Am. Acad. xii. 66.

1. **A. decumbens,** Gray. Scabrous-puberulent: leaves from lanceolate to linear, tapering to the apex: umbel solitary: corolla depressed-globular in bud, hardly twice the length of the yellowish or dark-purplish hoods, which overtop the somewhat depressed anther-column: anther-wings salient, espe-

cially at the broader and strongly angulate upper portion: pollinia pear-shaped, short-caudicled. — Proc. Am. Acad. xii. 66. *Acerates decumbens*, Decaisne. From Utah through S. Colorado and New Mexico to Texas and Arkansas.

2. ASCLEPIAS, L. Milkweed. Silkweed.

Herbs, from deep and thickish perennial roots: flowers umbellate; the peduncles terminal and lateral, usually between the petioles: follicles soft-echinate, warty or naked.

§ 1. *Hoods sessile, not attenuate at base; the horn or crest conspicuous: anther-wings broadest and usually angulate-truncate and salient at base.*

* *Corolla and hoods orange-color: follicles naked, erect on a deflexed pedicel: leaves mostly irregularly alternate, seldom opposite: juice of stem not milky.*

1. **A. tuberosa,** L. Hirsute or roughish-pubescent, 1 or 2 feet high, very leafy to the top: leaves from lanceolate-oblong to linear-lanceolate, sessile or slightly petioled: umbels several and mostly cymose at the summit of the stem: hoods narrowly oblong, erect, deep bright orange, much surpassing the anthers, almost as long as the purplish- or slightly greenish-orange oblong corolla lobes, nearly equalled by the filiform-subulate horn: follicles cinereous-pubescent. — From S. Colorado and Arizona to Texas, thence eastward to Florida and Canada. Known commonly as "Butterfly-weed" or "Pleurisy-root."

* * *Corolla and crown greenish, yellowish, white, or merely purplish-tinged: leaves opposite or sometimes whorled, or the upper rarely alternate or scattered.*

+– *Follicles echinate with soft spinous processes and densely tomentose, large (3 to 5 inches long) and ventricose erect on deflexed pedicels: leaves large and broad, short-petioled, transversely veined: stems stout and simple, 2 to 5 feet high.*

2. **A. speciosa,** Torr. Finely canescent-tomentose: leaves from subcordate-oval to oblong, thickish: pedicels of the many-flowered dense umbel and the calyx densely tomentose: flowers purplish, large: corolla-lobes ovate-oblong: hoods spreading, the dilated body and its short inflexed horn not surpassing the anthers, but the centre of its truncate summit abruptly produced into a lanceolate-ligulate thrice longer termination: column hardly any: wings of the anthers notched and obscurely corniculate at base. — Ann. Lyc. N. Y. ii. 218. From Nebraska and Arkansas westward across the continent.

+– +– *Follicles wholly unarmed and smooth throughout, either glabrous or tomentulose-pubescent.*

+– *Erect or ascending on deflexed or decurved pedicels.*

= *Umbel solitary on the perfectly simple strict stem, elevated on a naked terminal peduncle: leaves all closely sessile, broad, transversely veined.*

3. **A. obtusifolia,** Michx. Glabrous and pale or glaucous, 2 or 3 feet high: leaves undulate, oblong or elliptical, 3 to 5 inches long, with rounded or retuse apex and cordate-clasping base: peduncle 2 to 12 inches long:

umbel loosely many-flowered: corolla dull greenish-purple: column as high as broad: hoods flesh-color, erosely truncate and somewhat toothed at the broad summit, hardly exceeding the anthers, shorter than the falcate-subulate incurved horn: anther-wings bicorniculate at base. — From Dakota to Texas and eastward across the continent.

= = *Umbels mostly more than one: peduncle not overtopping the leaves, sometimes none.*

a. *Leaves broad (from orbicular to oblong-lanceolate), large: hoods broad, little if at all overtopping the anthers: stems stout, a foot or more in height.*

4. **A. Jamesii,** Torr. Puberulent when young, soon *green and glabrous: leaves* about 5 pairs, approximate, *very thick and large, orbicular or broadly oval,* often emarginate and with a mucro, subcordate at base, nearly sessile, copiously transversely veined: umbels 2 or 3, all or mostly lateral, densely many-flowered: flowers greenish: column very short but distinct: *hoods barely equalling the anthers,* broad, *with a truncate entire summit,* which is equalled by the upper margin of the *falciform triangular crest, the apex of which extends into a short subulate horn partly over the top of the stigmatic disk.* — Bot. Mex. Bound. 162. Plains of Colorado to Arizona and Texas.

5. **A. arenaria,** Torr. Lanuginous-tomentose, in age glabrate: stems thickly leaved: leaves smaller, coriaceous when old, obovate or oval and retuse or the lower ovate, with rounded or subcordate base, somewhat undulate, distinctly petioled: umbels all lateral, rather densely many-flowered: corolla greenish white: column nearly half the length of the anthers: *hoods* about as broad as high, *surpassing the anthers,* truncate at base and summit, *the latter oblique and notched on each side near the inner angle, which forms an obtuse tooth; horn with included ascending portion or crest broadly semilunate as high as the hood; the abruptly incurved apex subulate-beaked, horizontally exserted,* or the slender termination ascending. — Bot. Mex. Bound. 162. On sandbanks, S. E. Colorado to New Mexico.

b. *Leaves narrow (lanceolate or linear), green, and nearly glabrous, the veins oblique: stems branching, a span or two high: hoods obtuse: column hardly any: follicles when young tomentose-canescent.*

6. **A. brachystephana,** Engelm. *Stems 6 to 10 inches high,* very leafy, cinereous-puberulent or tomentose when young, the inflorescence more floccose-tomentose: leaves from lanceolate with a broader rounded base to linear, short-petioled, very much surpassing the (3 to 8) few-flowered umbels: flowers lurid-purplish: *hoods only half the length of the anthers,* erect, *strongly angulate-toothed at the front;* the tip of the *erect subulate horn* exserted. — Torr. Bot. Mex. Bound. 163. Dry sandy soil, from Wyoming and Colorado to Arizona and Texas.

7. **A. uncialis,** E. L. Greene. *Stems an inch or two high:* flowers like the last, but the *hoods only a little shorter than the anthers,* the back rounder, and *the triangular anterior lobes or auricles not projecting, while a short fleshy process takes the place of the subulate horn.* — Bot. Gazette, v. 64. Wyoming, Colorado, and New Mexico.

c. *Leaves from ovate to oblong, mostly pubescent or puberulent: stems a foot or more high: hoods obtuse, 2 or 3 times the length of the anthers, not tapering to*

base, entire at summit, involute-concave; the falcate or subulate horn free at or below the middle of the horn, and incurved or inflexed over the stigmatic disk.

8. **A. ovalifolia,** Decaisne. *Tomentulose-pubescent: stem rather slender: leaves thinnish,* from ovate or oval to ovate lanceolate, mostly acute, rounded at base, distinctly petioled, *the midrib and veins slender, the veinlets reticulated:* umbels few, loosely 10 to 18-flowered, on *peduncles which seldom equal the pedicels:* corolla greenish-white with purplish outside: *hoods oval or broadly oblong in outline, not auriculate at base, the inner margins below the middle extended into a large acute tooth or lobe; the horn broad and rather short:* anther-wings rounded and mostly entire. — From Dakota to the Saskatchewan and N. Illinois.

9. **A. Hallii,** Gray. *Puberulent-glabrate: stem stout: leaves thickish,* ovate-lanceolate or oblong-lanceolate with rounded base and rather acute apex, short-petioled, *the stout midrib and straight veins prominent underneath:* umbels few and corymbose, many-flowered, on *peduncles somewhat longer than the pedicels:* corolla greenish-white and purplish: *hoods elongated-oblong in outline,* entire, *hastately 2-gibbous above the narrower base, a little surpassing the sickle-shaped horn:* anther-wings unappendaged at base. — Proc. Am. Acad. viii. 69. *A. ovalifolia* of Fl. Colorado, 114. Colorado.

++ ++ *Follicles erect on erect pedicels: leaves usually verticillate, filiform, glabrous.*

10. **A. verticillata,** L. Stems a foot or two high, slender, very leafy: leaves mostly in whorls of 3 to 6, or some scattered, filiform-linear, with revolute margins: umbels numerous, small, many-flowered, on peduncles longer than the pedicels: corolla greenish-white: hoods white, broadly ovate and entire, with somewhat auriculate involute base, barely equalling the anthers, much shorter than their elongated-subulate falcate-incurved horn. — In dry soil, from New Mexico and Colorado to Nebraska, and eastward across the continent.

Var. **pumila,** Gray. A span or more high, many-stemmed from a fascicled root: leaves much crowded, filiform: peduncles seldom longer than the pedicels. — Proc. Am. Acad. xii. 71. From New Mexico to Nebraska and Kansas.

§ 2. *Anther-wings widening to the broadly rounded base and conspicuously auriculate-notched just above it: hoods sessile, with a narrow wholly adnate internal crest terminating in a minute horn: pollinia short and thick, arcuate-obovate.*

11. **A. stenophylla,** Gray. Puberulent, but foliage glabrous: stems slender, 1 or 2 feet high, simple: leaves long and narrowly linear, with scabrous and more or less revolute margins and a strong midrib; the upper alternate and the lower opposite: umbels several, 10 to 15 flowered: flowers greenish: hoods whitish, erect, equalling the anthers, conduplicate-concave, the base of each inner margin appendaged by a cuneate erosely truncate lobe, the apex 2-lobed and the narrow internal crest exserted in the sinus in the form of an intermediate tooth: interior crown of 5 very small 2-lobed processes between the bases of the anthers: follicles long-acuminate, erect on the ascending pedicel. — Proc. Am. Acad. xii. 72. *Acerates angustifolia,* Decaisne. From Colorado and N. Texas to Nebraska and W. Arkansas.

3. ACERATES, Ell. Green Milkweed.

Perennial herbs, resembling *Asclepias*, but distinguished by the total absence of horn or crest to the hoods. Flowers small, greenish or barely tinged with purple.

* *Mass of anthers and stigma globular, not equalled by the hoods: column below the hoods evident: leaves mainly alternate-scattered, very numerous.*

1. **A. auriculata,** Engelm. Glabrous up to the inflorescence: stem 2 or 3 feet high, slender: leaves linear-filiform, with scabrous margins: umbels several, lateral: column below the hoods very short: hoods oval or quadrate, emarginately or sometimes 3-crenately truncate, the involute margins at base appendaged with a pair of remarkably large and broad auricles: anther-wings narrow and of equal breadth from top to bottom. — Bot. Mex. Bound. 160. From Colorado to New Mexico and S. Texas.

* * *Mass of anthers and stigma longer than broad, almost equalled by the hoods, the short insertion of which covers the very short column: leaves often opposite, mostly broader.*

2. **A. viridiflora,** Ell. Tomentose-puberulent: stem 1 or 2 feet high: leaves oval or oblong and obtuse or retuse, or sometimes narrower and acute: *umbels* 2 *to* 5 or sometimes solitary, dense, *mostly lateral and subsessile: pedicels little over twice the length of the* reflexed narrowly oblong *lobes of the greenish corolla:* hoods somewhat fleshy, with small auricles at base much involute and concealed, alternated by as many *short and roundish or gland-like small internal teeth: anther-wings semi-rhomboid above, with a much longer tapering base.* — From Colorado to the Saskatchewan and eastward across the continent.

3. **A. lanuginosa,** Decaisne. Hirsute rather than woolly: stems a span or two high, *terminated by a single pedunculate umbel:* leaves frequently alternate or scattered, from oblong-ovate to lanceolate, with roundish base: *pedicels* 3 *or* 4 *times the length of the* oblong *lobes of the greenish corolla:* hoods purplish, obtuse and entire, involute auricles at base obscure if any: *the alternating internal teeth or lobes small and emarginate: anther-wings broadest and obtusely angulate below the middle.* — From the head-waters of the Missouri to Wisconsin and N. Illinois.

Order 50. GENTIANACEÆ. (Gentian Family.)

Smooth herbs, with a colorless bitter juice, opposite and sessile entire and simple leaves without stipules, regular flowers with the stamens as many as the lobes of the corolla, a one-celled ovary with two parietal placentæ, or nearly the whole ovary wall ovuliferous; the fruit a many-seeded capsule. Flowers cymose or simply terminal. In all ours the lobes of the corolla are convolute in the bud.

* Style distinct and slender, deciduous: anthers twisting in age.

1. **Erythræa.** Parts of the flower 5 or 4. Corolla salverform. Anthers oblong or linear, commonly exserted, twisting spirally in one or two turns after anthesis. Capsule from oblong-ovate to fusiform.

* * Style short and persistent, or none: anthers remaining straight.

+– Corolla without nectariferous pits or large glands.

2. **Gentiana.** Calyx commonly with a membranous tube. Corolla funnelform, campanulate, or salverform; the sinuses with or without plaits or appendages. Stamens on the tube of the corolla. Style very short or none. Seeds very numerous, not rarely covering the inner wall of the ovary.

3. **Pleurogyne.** Calyx deeply 4 to 5-parted. Corolla rotate, 4 to 5-parted; the divisions acute, a pair of scale-like appendages on their base. Stamens on the base of the corolla. Style none: stigmas decurrent down the sutures. Seeds extremely numerous, near the two sutures.

+– +– Corolla with one or two nectariferous pits, spots (glands), or an adnate scale to each lobe: calyx 4 to 5-parted.

4. **Swertia.** Corolla rotate, 5- (rarely 4-) parted. Style none or very short. Capsule ovate. Leaves sometimes alternate.

5. **Frasera.** Corolla rotate, 4-parted; the lobes bearing a single or double fringed gland, and sometimes a fimbriate crown at base. Stamens on the very base of the corolla: filaments often monadelphous at base. Capsule coriaceous, commonly flattened. Leaves verticillate or opposite.

1. ERYTHRÆA, Renealm. CENTAURY.

Low herbs: the flowers usually small and with broad stigmas.

1. **E. Douglasii,** Gray. Slender, a span to a foot high, loosely and paniculately branched, usually sparsely flowered: leaves from oblong to linear, mostly acute: flowers all on strict and slender peduncles or pedicels: lobes of the pink corolla oblong, obtuse, at most 2 lines long, nearly half the length of the tube. — Bot. Calif. i. 480. Wyoming to Utah and westward to California and Oregon.

2. GENTIANA, Tourn. GENTIAN.

Herbs, with conspicuous flowers of various colors, in summer or autumn. Herbage and roots very bitter.

§ 1. *Corolla destitute of extended plaits or lobes or teeth at the sinuses.* — GENTIANELLA.

* *Flowers large or middle-sized, solitary, mostly 4-merous: corolla companulate-funnelform, its lobes usually fimbriate or erose, not crowned: a row of glands between the bases of the filaments.* (FRINGED GENTIANS.)

+– *Flower on a naked and usually long peduncle terminating the stem or branches, not bracteate at base: filaments naked: calyx with acutely carinate lobes, the tube sharply angled by the decurrent keels.*

1. **G. crinita,** Frœl. A foot or two high, often paniculate-corymbose, leafy: *leaves lanceolate or ovate-lanceolate from a rounded or subcordate partly clasping base:* corolla 2 inches long, sky-blue, rarely white; *its lobes cuneate-obovate, strongly fimbriate around the summit, less so down the narrowing sides:* capsule conspicuously stipitate. — Head-waters of the Missouri to Canada, thence southward to Georgia.

2. **G. serrata,** Gunner. Stem 3 to 18 inches high: *leaves linear or lanceolate-linear:* corolla 1 to 1½ inches long, sky-blue or rarely white; *its lobes oblong or spatulate-obovate, erosely fimbriate or toothed around the summit and sides, or sometimes either part nearly bare:* capsule short-stipitate. — *G. detonsa,*

Fries. From Nevada to Colorado, the Saskatchewan, and northward, thence eastward to New York and Canada.

+– +– *Flower 2-bracteate under or near the calyx: filaments ciliate-bearded below the middle: calyx hardly at all angled or carinate.*

3. **G. barbellata,** Engelm. Stems single or in pairs from the slender fusiform root or caudex, 2 to 5 inches high: leaves rather thick and fleshy, obtuse, with roughish callous margins; the radical spatulate or slender-petioled; the 2 or 3 cauline pairs spatulate-linear, or the uppermost narrowly linear and connate at base: corolla bright blue, 1 to 1½ inches long, twice the length of the calyx; the lobes oblong, erose-denticulate above, conspicuously fringed along the middle: capsule not stipitate. — Trans. St. Louis Acad. ii. 216. Alpine region of the Colorado mountains.

* * *Flowers smaller, 4 to 5-merous: corolla somewhat funnelform or salverform when expanded; the lobes entire, their base mostly crowned with setaceous filaments: capsule seldom stipitate.*

+– *Peduncles elongated and naked from a very short stem, one-flowered.*

4. **G. tenella,** Rottb. An inch to a span high: leaves oblong or the lowest spatulate: calyx deeply 5- (or 4-) parted: corolla 2½ to 4 lines long, double the length of the calyx, blue; its lobes ovate-oblong, rather obtuse, little shorter than the tube: fimbriate crown conspicuous at the throat. — High alpine regions in Colorado and northward to the arctic regions.

+– +– *Peduncles short or none, terminal and lateral on a comparatively elongated stem.*

5. **G. heterosepala,** Engelm. A span or two high, racemosely few-flowered: leaves ovate-lanceolate or oblong: *calyx very unequally 5-parted; two of the lobes large and foliaceous,* ovate, acute, *equalling the tube of the pale blue corolla* (4 to 6 lines long); the other three linear-subulate and shorter: *setæ of the crown copious,* united below into a membrane on the base of each corolla lobe. — Trans. St. Louis Acad. ii. 215. In the mountains of New Mexico, Colorado, and Utah.

6. **G. Amarella,** L. From 2 to 20 inches high: leaves from lanceolate to narrowly oblong, or the lowest obovate-spatulate: *calyx 5-cleft below the middle; the lobes lanceolate or linear, equal* or one or two of them longer, *all shorter than the mostly blue corolla,* which is ½ inch or more long.

Var. **acuta,** Hook. f. Calyx almost 5-parted: *crown usually of fewer and sometimes very few setæ.* — *G. Amarella* of the Western Reports. Throughout British America and southward along the mountains to New Mexico and California.

Var. **stricta,** Watson. *Stem* (sometimes 2 to 4 feet high) *and branches strict,* remotely leafy: leaves thickish, the cauline lanceolate-linear: *flowers* numerous, commonly 4-merous, *smaller: calyx less deeply cleft: corolla whitish, little longer than the unequal calyx; setæ of the crown sometimes very few or even wanting.* — Bot. King's Exped. 278.

§ 2. *Corolla plicate at the sinuses, the plaits more or less extended into thin-membranaceous teeth or lobes: no crown nor glands.* — PNEUMONANTHE.

* *Dwarf: leaves small and with white cartilaginous or scarious margins: flowers solitary and terminal: calyx narrow, 4 to 5-toothed: corolla salverform when*

expanded; the lobes or plaits in the sinuses broad and emarginate: anthers cordate.

7. **G. humilis,** Stev. *Stems* single or numerous, 1 to 5 inches long, *erect or ascending: leaves glaucescent and broadly white-margined;* the radical orbicular or ovate and rosulate; *cauline linear-oblong, erect, connate-sheathing,* 2 or 3 lines long: *corolla whitish or dull-colored;* its tube little exceeding the calyx; the limb ½ inch in diameter: *capsule clavate-obovate, at length exserted on a long and stout stipe much beyond the flower.* — Grassy banks in the mountains from Colorado to Wyoming.

8. **G. prostrata,** Hænke. *Stems weaker* than in the preceding, and when elongated the *lateral ones often procumbent: leaves ovate, less erect, greener, and less white-margined: flower 4-merous: corolla azure-blue, in fruit enclosing the linear-oblong rather short-stipitate capsule.* — Alpine regions from Colorado northward.

* * *Flowers comparatively large, mostly short-peduncled or sessile: anthers linear or oblong: usually a pair of bracts under the flower.*

\+ *Dwarf,* 1 *to* 3*-flowered: cauline leaves only* 2 *to* 4 *pairs.*

9. **G. frigida,** Hænke. Stems 1 to 5 inches high: leaves linear, varying to lanceolate or spatulate, thickish, the pairs connate-sheathing at base: calyx-tube obconical: corolla funnelform, 1½ inches long, yellowish white or tinged with blue, purplish-dotted; the lobes short and broad; the plaits entire and broad but slightly extended at summit. — Including var. *algida,* Pall. Alpine regions of Colorado, Utah, and northward.

\+ \+ *Low: stems several from the same caudex: cauline leaves* 6 *to* 16 *pairs, more or less connate or even sheathing at base; the uppermost involucrate around the sessile terminal flower or* 3 *to* 5*-flowered cluster: corolla blue,* 1 *to* 1½ *inches long; the lobes broadly ovate, and the appendages at the sinuses* 2*-cleft or lacerate.*

10. **G. calycosa,** Griseb. A span or more high: leaves ovate; the lowest pairs usually smaller and with connate-sheathing base, the upper hardly so; the involucrate uppermost leaves *somewhat exceeding the calyx of the commonly solitary flower: calyx-lobes ovate or oblong, or even subcordate, about the length of the tube:* corolla oblong-funnelform, its appendages in the sinuses triangular-subulate, *laciniate, or* 2*-cleft at the tip.* — California and Oregon to Montana, Wyoming, and northward.

11. **G. Parryi,** Engelm. A span or more high: *leaves glaucescent,* thickish, ovate, varying to oblong-lanceolate, most of the pairs with a somewhat sheathing base; *the involucrate uppermost* 2 *or* 3 *concealing the calyx and sometimes almost equalling the corolla of the* 1 *to* 5 *flowers: lobes of the calyx short-linear, more or less shorter than the tube:* appendages at the sinuses of the corolla narrow, *deeply* 2*-cleft.* — Trans. St. Louis Acad. ii. 218. Alpine and subalpine regions of New Mexico, Colorado, Utah, and Nevada.

\+ \+ \+ *Stems rather taller, many-leaved: flowers not involucrate: the laciniate-toothed or cleft appendages at the sinuses of the corolla sometimes almost equalling the lobes.*

12. **G. affinis,** Griseb. Stems clustered, a span or more high: leaves from oblong or lanceolate to linear: flowers from numerous and thyrsoid-racemose to few or rarely almost solitary: bracts lanceolate or linear: *calyx-*

lobes linear or subulate, unequal and variable, the longest rarely equalling the tube, the shorter sometimes minute: *corolla an inch or less long, rather narrowly funnelform; its lobes ovate, acutish or mucronulate-pointed*, spreading. — From the mountains of New Mexico and California to British Columbia and the Saskatchewan.

13. **G. Bigelovii,** Gray. Very similar to the last, but the *corolla is oblong, with shorter lobes*, and bears *salient crenulate or roughened ridges* which in the bud externally border the infolded plicæ: *the stipe* is shorter and broader and *completely fistulous.* — Proc. Am. Acad. xix. 87. *G. affinis* in part. Colorado to Arizona.

14. **G. Forwoodii,** Gray. Resembling *G. affinis*, but the *corolla decidedly smaller* (¾ inch long), *narrow, and with shorter and rounder lobes, these little surpassing the plical appendages:* stems 6 to 12 inches high and equably leafy to the very top: *calyx* subcampanulate, *with no vestige of lobes or teeth.* — Proc. Am. Acad. xix. 86. High meadows of the Wind River Mountains, Wyoming.

3. PLEUROGYNE, Eschsch.

Small annuals of cold regions, with blue or whitish flowers, and distinguished by the remarkable decurrent stigmas.

1. **P. rotata,** Griseb. Stems 2 to 10 inches high, the smaller simple and 1-flowered; the larger either simple and racemosely several-flowered or fastigiately much branched: leaves linear or lanceolate, or the radical ones short and spatulate: sepals similar to the upper leaves: lobes of the corolla bearing at base a pair of glandular and scale-like processes. — In subalpine regions of Colorado and northward throughout British America.

4. SWERTIA, L.

Simple-stemmed perennials, occasionally with alternate leaves, the lower tapering into a margined petiole: inflorescence thyrsoid: flowers blue, varying to white.

1. **S. perennis,** L. A span or more high: lowest leaves oblong or obovate-spatulate (2 to 4 inches long); upper cauline few and narrower, sessile: inflorescence racemiform or narrowly paniculate, few to many-flowered: sepals narrowly lanceolate: lobes of the corolla bearing at base a pair of nectariferous pits which are crested with a fringe. — Colorado, Utah, and northward.

5. FRASERA, Walt.

Large and stout herbs; with single erect stem from a thick bitter root, the broader leaves commonly nervose, inflorescence thyrsoid with copious flowers and dark-dotted corolla.

1. **F. speciosa,** Dougl. Stem 2 to 5 feet high, very leafy: leaves in 4's and 6's; the radical and lowest cauline obovate or oblong, 6 to 10 inches long; the upper lanceolate and at length linear: flowers very numerous in a long leafy thyrsus: lobes of the greenish-white or barely bluish and dark-dotted corolla oval-oblong, bearing a pair of contiguous and densely long-fringed glands about the middle, and a distant transversely inserted and setaceously multifid scale-like crown near the base. — In the mountains from Wyoming to Oregon, and southward to New Mexico and California.

Order 51. POLEMONIACEÆ. (Polemonium Family.)

Herbs, with alternate or opposite leaves, regular 5-merous and 5-androus flowers, the lobes of the corolla convolute in the bud, a 3-celled ovary and a 3-lobed style: the pod few to many-seeded, its 3 valves usually breaking away from the central column.

1. **Phlox.** Corolla strictly salverform, with slender tube and narrow orifice. Stamens unequally inserted on the tube of the corolla: filaments very short: anthers mostly included. Leaves opposite and entire.
2. **Gilia.** Corolla from campanulate to funnelform or salverform, with an open orifice. Stamens equally or unequally inserted: filaments not declined, naked at base. Leaves various.
3. **Polemonium.** Corolla from funnelform to nearly rotate. Stamens equally inserted: filaments more or less declined and usually pilose-appendaged at base. Leaves all alternate, pinnate or pinnately parted.

1. PHLOX, L. Phlox.

Cauline leaves sessile and opposite, or some of the upper alternate: flowers cymose, showy, and variously colored. Our Rocky Mountain forms are somewhat suffrutescent, chiefly with narrow or minute and thickish-margined leaves, and branches or peduncles mostly one-flowered.

* *Densely cespitose and depressed, mostly forming cushion-like evergreen mats or tufts: the short leaves crowded up to the solitary and usually sessile flowers, and also fascicled.*

+ *Leaves more or less beset or ciliate with cobweb-like or woolly hairs,*

++ *Very short, broadish or scale-like, soft, barely mucronate, appressed-imbricated: plants very depressed, moss-like, forming pulvinate tufts: lobes of the corolla entire.*

1. **P. bryoides,** Nutt. *Copiously lanate: leaves very densely appressed-imbricated in 4 strict ranks*, on the loosely tufted branches, scale-like, ovate- or triangular-lanceolate, minute (1½ lines long), with rather inflexed margins: *tube of the corolla considerably longer than the calyx;* its cuneate lobes barely 1½ lines long. — Pl. Gamb. 153. Alpine summits in Wyoming and northward.

2 **P. muscoides,** Nutt. Like the preceding, *more resembling some canescent moss:* the branches much tufted, very short: *leaves less strictly 4-ranked and less lanate,* ovate-lanceolate: *tube of the corolla not surpassing the calyx.* — Jour. Acad. Philad. vii. 42. Mountains at the sources of the Missouri.

++ ++ *Leaves subulate or acerose, somewhat rigid, less appressed: plants forming broad mats 2 to 4 inches high.*

3. **P. Hoodii,** Richards. Sparsely or loosely lanate, becoming glabrate: *leaves rather rigid, erect,* somewhat loosely imbricated: *tube of the* (white?) *corolla not exceeding the calyx; its lobes* obovate, *entire.* — From the mountains of S. W. Wyoming northward.

4. **P. canescens,** Torr. & Gray. More lanate and canescent: *leaves* imbricated, *soon recurved-spreading* above the appressed base; *tube of the white corolla at length exceeding the calyx; the obovate lobes entire or emarginate.* — Pacif. R. Rep. ii. 8. From Wyoming and Colorado to the mountains of New Mexico and California.

+ + *Leaves rigid, destitute of woolly or cobwebby hairs, the margins naked or ciliate with rigid or rather soft hairs: plants either densely or loosely tufted: the leaves mostly less crowded.*

5. **P. cæspitosa,** Nutt. *Leaves linear-subulate or oblong-linear, commonly much crowded, hispid-ciliate,* otherwise glabrous or with some short glandular-tipped hairs: corolla with tube somewhat exceeding the calyx. — Jour. Acad. Philad. vii. 41. Mountains of Colorado, Montana, and westward. Occurs under several dwarfed forms.

6. **P. Douglasii,** Hook. *Less densely tufted,* either pubescent or nearly glabrous: *leaves acerose or narrowly linear subulate, less rigid and usually less crowded, often spreading, their margins hirsutely ciliate next the base or naked: flowers subsessile or short-peduncled:* corolla (purple, lilac, or white) with tube exceeding the calyx. — From Montana to Utah, Colorado, and westward.

Var. **longifolia,** Gray. A rigid form, of more arid regions, and *long and narrow less fascicled leaves.* — Proc. Am. Acad. viii. 254. W. Nebraska to Oregon and California.

* * *Loosely tufted or many-stemmed from a merely woody-persistent base, with linear or lanceolate spreading leaves, which are little if at all fascicled in the axils: flowers slender-peduncled.*

7. **P. longifolia,** Nutt. *Nearly glabrous or pubescent,* much branched or many-stemmed, 3 to 8 inches high: leaves mostly narrowly linear, 1 to 2½ inches long: *calyx more or less angled by the white-membranaceous replicate sinuses:* lobes of the rose-colored or white corolla obovate- or oblong-cuneate, entire or retuse: *style long and slender.* — Jour. Philad. Acad. vii. 41. From Colorado to Montana and westward.

Var. **brevifolia,** Gray. A depressed or dwarf form; with *leaves 3 to 4 lines long,* rigid and with more cartilaginous margins, at least the lower lanceolate or ovate-lanceolate. — Proc. Am. Acad. viii. 254.

8. **P. nana,** Nutt. *Glandular and roughish-pubescent,* loosely and copiously branching a span or more high: leaves linear, 1 to 2 inches long, those of the branches often alternate: flowers scattered or somewhat corymbose: *calyx not at all angled:* lobes of the rose-red or white corolla ample and broadly cuneate-obovate or roundish, entire or nearly so: *style very short.* — Pl. Gamb. 153. From S. Colorado to New Mexico and Texas.

2. GILIA, Ruiz & Pav.

A large and variable genus, broken up into many ill-defined sections, which are sometimes considered genera. Includes *Collomia,* Nutt., formerly separated by its unequally inserted stamens and solitary ovules, but both characters have failed. — Gray, Proc. Am. Acad. viii. 261; Ibid. xvii. 223, foot-note.

A. *Stamens usually unequally inserted: leaves mostly alternate, and pinnately incised or divided: seed-coat usually developing spiral threads when wetted.*

* *Leaves sessile and entire: ovules solitary: more or less viscid-pubescent or glandular plants.*

1. **G. linearis,** Gray. Branching and in age spreading, a span or two high: *flowers capitate-crowded and leafy-bracted: calyx obconical; its lobes triangular-lanceolate:* corolla from lilac-purple to nearly white, very slender. — Proc. Am. Acad. xvii. 223. *Collomia linearis,* Nutt. From Colorado and California northward throughout British America.

2. **G. gracilis,** Hook. At length corymbosely much branched and spreading, 2 to 6 inches high: leaves lanceolate or linear or the lowest oval or obovate: *flowers rather loosely cymose* or scattered: *calyx rounded at base; its lobes subulate-linear:* corolla purple or violet; its narrow tube yellowish: *the mucilage-cells of the seed-coat wholly destitute of spiracles!* — *Collomia gracilis,* Dougl. From Arizona and New Mexico northward through Colorado to British Columbia.

* * *Cauline leaves very numerous, simply pinnately parted into narrowly linear divisions: inflorescence thyrsiform or panicled: ovules numerous in each cell: slightly if at all viscid plants.*

3. **G. longiflora,** Don. *Glabrous,* loosely paniculate-branched: divisions of the leaves long and slender: *flowers somewhat corymbose on slender peduncles: corolla white,* strictly salverform, showy; the tube often 1½ inches long, with narrow orifice; *lobes orbicular or ovate.* — *Collomia longiflora,* Gray. W. Nebraska and Colorado to Texas and Arizona.

4. **G. aggregata,** Spreng. *Somewhat pubescent: stems 2 to 4 feet high,* leafy, sometimes loosely branching: leaves thickish, with narrowly linear mucronulate divisions: *thyrsoid narrow panicle loose* or interrupted; *the flowers sessile in small mostly short-pedunculate clusters:* calyx commonly glandular: *corolla from scarlet to pink-red* (rarely white), with narrow tube; *the lobes ovate or lanceolate,* acute or acuminate, *widely spreading, soon recurved.* — *Collomia aggregata,* Porter. From W. Nebraska to Oregon, and southward to California, New Mexico, and W. Texas.

Var. **attenuata,** Gray. Corolla-lobes lanceolate, *tapering gradually from the very base into a slender acumination:* calyx-lobes equally slender. — Synopt. Fl. ii. 145. Middle Park, Colorado.

B. *Stamens equally inserted: seed-coat sometimes developing spiral threads.*

* *Leaves either opposite or palmately divided, or both; their divisions from narrowly linear to filiform.*

+ *Leaves opposite: flowers small, in a head or dense cluster.*

5. **G. nudicaulis,** Gray. *Very glabrous,* an inch to a span high, at length branching from the base: *stem leafless from the cotyledons up to the inflorescence,* which is a close head or glomerule subtended by an *involucre of several entire ovate-lanceolate or lanceolate foliaceous bracts:* corolla salverform, white, pink, or yellow; *the tube* 3 or 4 lines long and *thrice the length of the calyx: ovules* 10 *to* 16 *in each cell.* — Proc. Am. Acad. viii. 266. Sandy plains, from Colorado to Nevada and Oregon. In spring.

6. **G. Nuttallii**, Gray. *Cinereous-puberulent* or the leaves glabrate, more or less woody at base: stems or branches a span to a foot high, terminated by a dense leafy cluster of flowers: *leaves 3 to 7 parted:* the divisions narrowly linear, mucronate: corolla white with a yellow more funnelform throat: *the tube not longer than the calyx: ovules a pair in each cell.* — Proc. Am. Acad. viii. 267. Mountains of Colorado and Utah to Arizona and the Sierras of California.

+– +– Leaves all alternate and much fascicled in the axils: flowers showy, solitary or few in a cluster at the summit of the branches.

7. **G. pungens,** Benth. Stems woody, tufted, very leafy: branches and mostly erectish or little spreading leaves viscid-pubescent, puberulent, or glabrate: leaves 3 to 7-parted, acerose or subulate, rigid and pungent: corolla rose or white: ovules 8 or 10 in each cell. — From the Upper Platte and Columbia to Arizona and California.

Var. **cæspitosa,** Gray. A low and dense form, imitating *Phlox Douglasii* in growth. — Proc. Am. Acad. viii. 267. Scott's Bluffs, Wyoming.

** * Leaves alternate and pinnately incised, cleft, or divided (rarely entire), occasionally some of the lowermost opposite.*

+– Flowers capitate-clustered, leafy-bracted; bracts and calyx-lobes acerose-pungent or cuspidate.

+– +– Calyx lobes and the mostly multifid bracts rigid and acerose-pungent: leaves, at least some of them, more than once pinnately-parted.

8. **G. intertexta,** Steud. *Erect or widely branched,* low and rather stout, *neither viscid nor glandular: stem retrorsely pubescent:* leaves mainly glabrous, *with divaricate acerose-spinescent divisions sparingly divided or simple: flowers densely glomerate:* tube of the calyx and base of the bracts *strongly villous with white spreading hairs*; its lobes equalling the *white corolla* (3 or 4 lines long): *ovules and seeds 3 or 4 in each cell.* — From the Rocky Mountains westward to California and Oregon.

9. **G. minima,** Gray. *Depressed, often forming broad tufts,* ½ to 2 inches high, *glabrate: leaves acicular and with simpler and fewer divisions* than the preceding: *tube of the calyx white-hairy in the broad sinuses,* as long as the unequal lobes, which equal or exceed the *white corolla* (1½ lines long): *ovules 1 to 3 in each cell.* — Proc. Am. Acad. viii. 269. In very dry regions from Dakota to Colorado and Oregon.

10. **G. Breweri,** Gray. *Erect or at length much branched and diffusely spreading,* an inch to a span high, *very minutely glandular-puberulent all over: flowers less glomerate: leaves with mostly simple acicular-subulate divisions:* calyx-lobes similar to these, narrowly subulate, about equalling the *yellow corolla* (3 or 4 lines long), 3 or 4 times the length of the tube: *ovules 1 or 2 in each cell.* — Proc. Am. Acad. viii. 269. From Wyoming to Utah, Nevada, and California.

+– +– Calyx-lobes and bracts cuspidate but not pungent: leaves simply pinnatifid or entire.

11. **G. spicata,** Nutt. *Stems rather stout, erect,* simple, or several from the fusiform root, a span or two high: *capitate flower-clusters crowded in an elongated virgate and spike-like thyrsus: leaves thickish, almost filiform, some*

about 3-*cleft*, occasionally all entire, barely mucronate: corolla-lobes shorter than the tube: anthers subsessile in the throat: *ovules* 4 *to* 6 *in each cell.* — Mountains of Colorado, to Utah and Wyoming.

Var. **capitata,** Gray. A dwarf form: *leaves nearly all entire: thyrsus short and capituliform:* filaments as long as the anther. — Alpine region, from the Black Hills of Dakota to Colorado.

12. **G. congesta,** Hook. *Stems erect or spreading,* 3 to 12 inches high, from a tufted base, *bearing single terminal or few and corymbose capituliform cymes: leaves with* 3 *to* 7 *mucronate divisions, or some of them entire:* lobes of the corolla nearly as long as the tube, which does not exceed the usually aristulate-tipped calyx-lobes: *exserted filaments* at length as long as the anthers: *ovules* 2 *to* 4 *in each cell.* — From Wyoming and Colorado to Oregon and California.

Var. **crebrifolia,** Gray. *Depressed;* the tufted stems 2 or 3 inches long, *crowded with small entire leaves, and terminated by a single capitate cluster.* — Mountains of Colorado and Utah.

13. **G. iberidifolia,** Benth. *Leaves more rigid and the lobes cuspidate-tipped,* as also the bracts: capitate cymes corymbose: *filaments shorter: ovules solitary in each cell.* — North Platte, Wyoming, and Nebraska.

14. **G. pumila,** Nutt. About a span high: *stems loosely woolly,* at least when young, *leafy: leaves narrowly linear, entire or most of them* 2 *to* 4-*parted into diverging linear lobes,* mucronate: flowers cymulose-glomerate and leafy-bracted: *tube of the corolla slender, about twice the length of* the aristulate-tipped *calyx-lobes: filaments* slender, inserted in the sinuses, *exserted,* shorter than the lobes of the corolla: *ovules about* 6 *in each cell.* — From W. Nebraska to W. Texas and west to the Sierra Nevada.

15 **G. polycladon,** Torr. About a span high: *stems puberulent or sparsely pubescent,* diffuse, *very few-leaved: leaves pinnatifid or incised; the lobes short, oblong,* abruptly spinulose-mucronate, those subtending the cymose cluster longer than the flowers: flowers cymulose-glomerate and leafy-bracted: *tube of the corolla hardly exceeding the* aristulate-mucronate *calyx-lobes: anthers* in the throat, *on very short filaments: ovules* 2 *in each cell.* — Bot. Mex. Bound. 147. W. Texas to Utah and Nevada.

+– +– *Flowers thyrsoid-paniculate, inconspicuously bracted or ebracteate, never yellow, ovules* 6 *in each cell.*

–+ –+ *Corolla rose-red: anthers subsessile in the throat.*

16. **G. Haydeni,** Gray. Almost glabrous, slightly glandular above, a span or more high, effusely much branched, somewhat corymbose: radical leaves pinnatifid; those of the branches linear and subulate, bract-like, entire: calyx-lobes subulate, shorter than the tube: corolla-tube ½ inch long, several times longer than the obovate lobes. — Proc. Am. Acad. xii. 79. On the San Juan in S. W. Colorado or adjacent Utah, *Brandegee.*

–+ –+ *Corolla bluish or white: filaments slender and much exserted.*

17. **G. stenothyrsa,** Gray. *Stem* simple, *virgate, very leafy up to the racemiform narrow thyrsus: leaves pinnately cleft into short oblong lobes:* bracts small and entire. *stamens moderately exserted:* corolla somewhat funnelform, white, nearly ½ inch long. — Proc. Am. Acad. viii. 276. Uinta Mountains, *Fremont.*

18. **G. pinnatifida,** Nutt. Stem simple or loosely branching, a span to 2 feet high: *inflorescence open-paniculate, often compound: leaves pinnately parted into linear or narrowly oblong lobes;* these sometimes again 1 or 2-lobed: *stamens conspicuously exserted:* corolla strictly salverform, 2 or 3 lines long, pale blue or violet, or the narrow tube white. — Proc. Am. Acad. viii. 276. In the mountains from S. Wyoming through Colorado to New Mexico.

+– +– +– *Flowers scattered or somewhat crowded, occasionally yellow: ovules one to many in each cell.*

++ *Corolla very small (2 lines or less), salverform, white: leaves filiform, entire, or sometimes 3-parted: ovules solitary in the cells: not viscid-glandular.*

19. **G. minutiflora,** Benth. *Glabrous,* or minutely glandular-puberulent above: *stem erect, a foot or two high, with many virgate and rigid slender branches:* upper leaves all reduced to minute subulate appressed bracts; the lower longer and *some of them 3-parted: flowers terminating and also sparsely spicately disposed along the branchlets, 2 lines long.* — Wyoming (on the Upper Platte) and Idaho.

20. **G. tenerrima,** Gray. *Minutely and sparsely glandular, low, effusely much branched; branches filiform: leaves entire: flowers loosely panicled,* on slender divergent pedicels, *minute.* — Proc. Am. Acad. viii. 277. Bear River Valley, Utah.

++ ++ *Corolla larger (3 to 12 lines), funnelform, purplish or yellow: leaves once or twice pinnately divided: ovules few or numerous in the cells: viscid-glandular.*

21. **G. inconspicua,** Dougl. A span to a foot or more high, usually with slight woolly pubescence when young, and viscid-glandular, *branching from the base: leaves mostly pinnatifid or pinnately-parted, or the lowest bipinnatifid,* with short mucronate-cuspidate lobes; *the uppermost becoming small, subulate and entire: flowers either somewhat crowded and subsessile or at length loosely panicled* and some of them slender-pedicelled: *corolla violet or purplish (3 to 5 lines long), narrowly funnelform.* — From Wyoming to Texas and westward.

22. **G. Brandegei,** Gray. Very viscid with glandular pubescence, pleasantly odoriferous, cespitose: *stems* a span to near a foot high, *simple: leaves all pinnate, elongated-linear in outline,* the radical crowded, the cauline scattered; leaflets very small and numerous, from oval to oblong-linear, some simple, others 2-parted and so appearing verticillate: *flowers several in a short and racemiform leafy thyrsus: corolla golden yellow, trumpet-shaped, an inch or less long.* — Proc. Am. Acad. xi. 85. On the face of cliffs in S. W. Colorado, *Brandegee.*

Var. **Lambornii,** Gray. Corolla lurid-yellowish or greenish. — Synopt. Fl. ii. 149. Alpine region of Sierra Blanca, S. Colorado.

3. POLEMONIUM, Tourn. Greek Valerian. Jacob's Ladder.

Inflorescence racemiform, thyrsiform, or cymulose-paniculate: flowers blue or white, rarely purplish, usually showy.

* *Corolla narrowly funnelform; its tube exceeding the calyx and longer than the limb: filaments naked or nearly so and not dilated at base: leaflets very small*

and crowded, so as seemingly to be verticillate: inflorescence capitate-congested or spiciform.

1. **P. confertum,** Gray. A span or more high, glandular-pubescent and viscid, musky fragrant: leaflets 1 to 3 lines long, mostly 2 to 3 divided; the divisions from round-oval to oblong-linear: flowers densely crowded, honey-scented: corolla deep blue, ½ to 1 inch long: ovules about 3 in each cell. — Proc. Acad. Philad. 1863, 73. Alpine regions from Colorado to California and northward.

Var **mellitum,** Gray. Usually a taller form: inflorescence more lax and leafy, becoming spiciform or racemose: corolla pale or sometimes white, an inch long, more narrowly funnelform. — With the type in Wyoming, Colorado, and Utah.

* * *Corolla campanulate-funnelform; its tube not exceeding the calyx and shorter than the ample limb: filaments usually dilated and pilose-appendaged at base: leaflets simple and entire, sometimes confluent: inflorescence open.*

+ *Low, about a span high from cespitose-branching and mostly thickened root-stocks: flowering stems only* 1 *to* 3*-leaved: leaflets seldom* ½ *inch long.*

2. **P. viscosum,** Nutt. Dwarf and with thick densely tufted rootstocks, *viscid-puberulent:* leaflets very numerous and crowded or even imbricated, ovate or roundish, *at most* 1½ *lines long: flowers in a rather close cymulose cluster:* corolla blue or whitish, *its lobes about the length of the included tube: filaments not appendaged at base.* — High summits towards the sources of the Platte, *Nuttall.*

3. **P. humile,** Willd. More slender, and from somewhat creeping root-stocks, more or less viscid-pubescent: *leaflets* 15 to 21, from round-oval to oblong, 2 *to* 6 *lines long: flowers rather few in the clusters:* corolla blue or purplish, *its ampler lobes much longer than the short included tube: filaments pilose at the dilated base:* ovules 2 to 4 and seeds 1 or 2 in each cell.

Var. **pulchellum,** Gray. *Viscid pubescence mostly minute, or the leaflets often nearly glabrous and naked:* flowers smaller: the lobes of the corolla only 2 or 3 lines long, violet or lavender blue, in some forms nearly white. — Synopt. Fl. ii. 150. *P. pulchellum,* Bunge. Mountains of Colorado and the Sierra Nevada, northward to the Arctic coast.

+ + *Taller, a foot or more high, from slender rootstocks or roots: leaves and leaflets larger.*

4. **P. cæruleum,** L. *Either glabrous or viscid-pubescent: stem* mostly strict and virgate, 1 to 3 feet high, 5 *to* 10*-leaved:* leaflets from linear-lanceolate to oblong-ovate, 9 to 20 lines long: *flowers numerous in a naked and narrow thyrsus or panicle: corolla blue,* an inch or less in diameter: *style and stamens usually protruding.* — From the Colorado mountains to California, and far northward; very much less abundant in the N. Atlantic States.

5. **P. foliosissimum,** Gray. *Very viscid-pubescent throughout and strong-scented: stem very leafy throughout:* leaflets from lanceolate to ovate-lanceolate: *flowers corymbose-cymose,* smaller: *corolla commonly white or cream-color,* sometimes violet, twice the length of the calyx: *style and stamens not protruding* — Synopt. Fl. ii. 151. *P. cæruleum,* var. *foliosissimum,* Gray. Mountains of New Mexico, Colorado, Wyoming, and westward.

Order 52. **HYDROPHYLLACEÆ.** (Waterleaf Family.)

Herbs, commonly hairy, with mostly alternate leaves, regular 5-merous and 5-androus flowers: the ovary entire and 1-celled with 2 parietal (4 to many-ovuled) placentæ, or rarely 2-celled: style 2-cleft or 2 separate styles: fruit a 2-valved, 4 to many-seeded pod. Flowers chiefly blue or white, in one-sided cymes or racemes.

* Style more or less 2-cleft: ovary 1-celled, and mostly hispid, at least at the apex.

+ Ovary lined with the dilated and fleshy placentæ.

1. **Hydrophyllum.** Stamens and style mostly conspicuously exserted. Leaves alternate. Calyx with or without a small appendage at each sinus. Corolla campanulate; the tube within bearing a linear longitudinal appendage opposite each lobe, with infolded edges, forming a nectariferous groove Filaments bearded at the middle.
2. **Ellisia.** Stamens shorter than the corolla. Lower and sometimes all the leaves opposite. Calyx destitute of appendages at the sinuses, usually much enlarged under the fruit. Corolla campanulate, the internal appendages minute or obsolete.

+ + Ovary with narrow parietal placentæ, in fruit projecting inward more or less.

3. **Phacelia.** Calyx naked at the sinuses, deeply 5-parted. Stamens equally inserted low down on the corolla. Inflorescence scorpioid. Leaves all, or all but the lowest, alternate.

* * Styles 2, distinct to the base: ovary more or less completely 2-celled, and in ours nearly glabrous.

4. **Nama.** Corolla funnelform or somewhat salverform. Filaments and styles more or less included; the former commonly unequal and often unequally inserted. Ovules and seeds numerous, on transverse lamelliform placentæ, which approximate or cohere in the axis of the ovary, but separate in the loculicidal dehiscence. Low herbs, with (in ours) entire leaves.

1. HYDROPHYLLUM, Tourn. Waterleaf.

Herbs with petioled ample and lobed or divided alternate leaves, and cymose clusters of violet-blue or white flowers. Our species have fleshy horizontal rootstocks, the calyx naked at the sinuses, leaves pinnatifid or pinnate, and the peduncle elongated, surpassing the petiole.

1. **H. occidentale,** Gray. *Pubescent, hirsute, or sparingly hispid,* a foot or two high: *leaves elongated-oblong in outline, pinnately parted or divided into 7 to 15 divisions;* divisions oblong, 1 or 2 inches long, mostly incised or few-cleft, obtuse: cymes mostly dense or capitate: calyx deeply parted, its divisions lanceolate: corolla violet-purple, varying to white, ½ inch long. — Proc. Am. Acad. x. 314.

Var. **Fendleri,** Gray. *Pubescence mainly hirsute or hispid: divisions of the leaves inclined to ovate-lanceolate, acute or acuminate, incisely serrate:* cyme rather open: corolla white or nearly so. — Shady ravines, from New Mexico to Colorado.

2. **H. Virginicum,** L. *Stem* (1 or 2 feet high) *and bright green leaves almost glabrous,* or with short scattered hairs: *leaves ovate in general outline, 3 to 5-parted or divided;* divisions (2 to 4 inches long) ovate-lanceolate or

rhomboid-ovate, acuminate or acute, coarsely incised-toothed; the lowest commonly 2-cleft and the terminal one often 3-lobed: peduncle usually once or twice forked: cyme at length open: calyx 5-parted to the very base into narrow linear and spreading hispid-ciliate divisions: corolla nearly white or sometimes deep violet, about ¼ inch long. — Across the continent.

2. ELLISIA, L.

Plants with tender somewhat hirsute herbage: peduncles solitary or racemose: corolla whitish, mostly small in comparison with the stellate calyx. In ours the leaves are once pinnately parted, and the upper mostly alternate.

1. **E. Nyctelea,** L. A span to a foot high, at length very diffuse: leaves on naked or barely margined petioles; the divisions 7 to 13, lanceolate, acute, mostly 1 to 3-toothed or lobed: peduncles solitary in the forks or opposite the leaves, or some of the later ones racemose and secund: calyx-lobes acuminate, longer than the capsule: corolla rather shorter than the calyx. — Upper Arkansas, Colorado, to the Saskatchewan, and eastward across the continent.

3. PHACELIA, Juss.

Corolla blue, purple, or white, never yellow, except the tube of certain species; the tube with or without internal folds: calyx-lobes more or less enlarging in fruit: seed-coat reticulated or pitted.

§ 1. *A pair of ovules to each placenta: seeds as many or by abortion fewer: lobes of the campanulate corolla entire (or rarely erose-dentate); the tube with* 10 *laminate appendages in pairs at the base of the stamens.* — EUPHACELIA.

* *Leaves all simple and entire, or some of the lower pinnately* 3 *to* 5*-parted or divided: capsule ovate, acute: seeds densely alveolate-punctate.*

1. **P. circinata,** Jacq. f. Hispid and the foliage strigose, and either green or canescent, a span to 2 feet high: leaves from lanceolate to ovate, acute; the lower tapering into a petiole and commonly some of them with one or two pairs of smaller lateral leaflets: inflorescence hispid; the dense spikes thyrsoid-congested: corolla whitish or bluish: filaments much exserted, sparingly bearded. — On dry ground, from New Mexico and California to Dakota and British Columbia.

* * *Leaves pinnately toothed, lobed, or compound, and the lobes or divisions toothed or incised: capsule globular or ovoid, obtuse: seeds with excavated ventral face divided by a salient ridge.*

← *Calyx, etc. not setose-hispid.*

2. **P. integrifolia,** Torr. A span to 2 feet high, strict, viscid-pubescent or hirsute, very leafy: *leaves* ovate-oblong or lanceolate, sessile or the lower short-petioled with a commonly subcordate base, *simply or mostly doubly crenate-toothed, sometimes incised:* spikes crowded, at first thyrsoid: corolla whitish or bluish: stamens and style long exserted. — Ann. Lyc. N. Y. ii. 222. Dry soil, Colorado to Texas, Arizona, and Utah.

3. **P. glandulosa,** Nutt. Viscid-pubescent and glandular, softly if at all hirsute, a span to a foot or more high: *leaves irregularly and interruptedly twice pinnatifid, or below divided;* the numerous lobes small, somewhat incised, obtuse: corolla bluish, purplish, or white, with lobes shorter than the tube: stamens and style moderately or conspicuously exserted. — Gravelly soil, Colorado to Arizona and Texas.

Var. **Neo-Mexicana,** Gray. Lobes of the corolla either slightly or conspicuously erose-denticulate. — *P. Neo-Mexicana,* Thurber.

+– +– *Calyx more or less setose-hispid.*

4. **P. Popei,** Torr. & Gray. Viscid-pubescent and hispid with spreading hairs, a span to a foot high: leaves bipinnately parted or pinnatifid; the divisions pinnatifid, with 5 to 9 short, obtuse lobes: calyx-lobes a little longer than the globose capsule: corolla white, campanulate, its lobes entire: stamens at length much exserted. — Pacif. R. Rep. ii. 172. Colorado and southward. Included under *P. glandulosa,* Nutt., in Synopt. Fl. ii. 160, but restored in Proc. Am. Acad. xix. 87.

§ 2. *Ovules and seeds several* (6 *to* 12) *or more numerous on each placenta: appendages of the mostly campanulate corolla in the form of* 10 *vertical salient lamellæ.* — EUTOCA.

5. **P. sericea,** Gray. A span to a foot high from a branching caudex, silky-pubescent or canescent, or the simple virgate stems and inflorescence villous-hirsute, rather leafy to the top: *leaves pinnately parted into linear or narrow-oblong numerous* and often again few-cleft or pinnatifid *divisions,* silky-canescent or sometimes greenish; the lower petioled; the uppermost simpler and nearly sessile: *short spikes crowded in a naked spike-like thyrsus:* corolla violet-blue or whitish: *stamens long exserted: capsule a little longer than the calyx.* — Mountains of Colorado, Nevada, and northward.

6. **P. Menziesii,** Torr. A span to a foot high, at length paniculate-branched, hispid or roughish-hirsute: *leaves* mostly sessile, *linear or lanceolate and entire,* or some of them deeply cleft; the lobes few or single, linear or lanceolate, entire: *spikes or spike-like racemes thyrsoid-paniculate,* at length elongated and erect: corolla bright violet or sometimes white: *stamens about the length of the corolla: capsule shorter than the calyx.* — Watson, Bot. King Exp. 252. Montana to Utah and westward.

4. NAMA, L.

Low herbs: the corolla purple, bluish, or white. In ours the corolla is short-funnelform and hardly exceeding the calyx, the flowers are in the forks of the stem, and the leaves are entire.

1. **N. dichotomum,** Ruiz & Pav., var. **angustifolium,** Gray. Erect, a span high, minutely pubescent, glandular: stem repeatedly forked and with a nearly sessile flower in each fork: leaves narrow, linear or nearly so: sepals narrowly linear: seeds marked with about 5 longitudinal rows of large pits, from 4 to 6 in each row. — Proc. Am. Acad. viii. 284. Colorado and New Mexico.

Order 53. **BORRAGINACEÆ.** (Borage Family.)

Chiefly rough-hairy herbs, with alternate entire leaves, and symmetrical flowers with a 5-parted calyx, a regular 5-lobed corolla, 5 stamens inserted on its tube, a single style and a deeply 4-lobed ovary (occasionally undivided), which forms in fruit 4 seed-like nutlets, each with a single seed. — Flowers mostly on one side of the branches of a reduced cyme, imitating a scorpioid spike or raceme.

A. Ovary undivided (or only laterally 4-lobed) and surmounted by the style.

1. **Coldenia.** Calyx 5-parted; the divisions narrow. Corolla short-funnelform or nearly salverform; the lobes rounded, imbricated or sometimes partly convolute in the bud. Style 2-cleft or 2-parted: ovary (in ours) laterally 4-lobed. Fruit separating at maturity into 4 one-seeded nutlets, or by abortion fewer.

2. **Heliotropium.** Calyx deeply 5-parted, persistent. Corolla salverform or funnelform, plaited and mostly imbricated in the bud. Anthers connivent, sometimes cohering by pointed tips. Style entire or none: stigma peltate-annular, forming a complete ring, surmounted usually by an entire or 2-lobed tip or appendage: ovary 4-celled. Fruit 2 or 4-lobed, separating into two 2-celled and 2-seeded carpels or more commonly into 4 one-seeded nutlets.

B. Ovary 4-parted from above into 1-celled 1-ovuled divisions surrounding the base of the undivided style; stigma terminal, not annular.

* Nutlets obliquely attached by more or less of the ventral face or angle, or by the base or prolongation of it, to

← The more or less elevated gynobase which supports the style, not stipitate.

3. **Echinospermum.** Nutlets armed (either along a distinct margin or more or less over the whole back) with glochidiate prickles, forming burs. Calyx reflexed or open in fruit. Corolla white or blue: the throat closed with prominent fornicate appendages.

4. **Omphalodes.** Nutlets ascending or subhorizontal, with depressed back surrounded by a wing or margin which at maturity is reflexed, and its pectinate or spinulose teeth when present not glochidiate (disk sometimes so), somewhat supra-basal or ventral in attachment. Corolla rotate or very short funnelform, bright blue.

5. **Krynitzkia.** Nutlets erect, convex on the back and naked, wholly unappendaged (rarely with a narrow plane border), attached by the inner side above the middle or more or less towards the base. Corolla rotate or funnelform, white, and mostly small.

← ← Nutlets sessile or obscurely stipitate on a flat or merely convex receptacle.

6. **Mertensia.** Corolla from tubular-funnelform or trumpet-shaped to almost campanulate, with open throat, bearing obvious or obsolete transverse folds for crests. Stigma entire. Nutlets attached by a small or short scar just above the base to a barely or sometimes strongly convex gynobase. Often smooth and glabrous, with blue or rarely white flowers, mostly bractless.

* * Nutlets sessile and directly (usually centrally) attached by the very base to a plane gynobase.

7. **Myosotis.** Corolla short-salverform or almost rotate; its throat contracted by transverse crests; the rounded lobes convolute in the bud. Nutlets small, smooth and shining, thin-crustaceous. Racemes mainly ebracteate.

8. **Lithospermum.** Corolla salverform, funnelform, or sometimes approaching campanulate, either naked or with pubescent lines or intruded gibbosities or low transverse crests at the throat. Nutlets ovoid, bony, either polished and white or dull and rough. Flowers all subtended by leaves or bracts.

9 **Onosmodium.** Corolla tubular or oblong-funnelform, with open and wholly unappendaged throat; the lobes erect or hardly spreading; the sinuses more or less inflexed. Style filiform or capillary, very long: stigma exserted before the corolla opens. Nutlets ovoid or globular, bony, smooth and polished, white. Flowers all subtended by leafy bracts.

1. COLDENIA, L.

Low herbaceous plants, canescent or hispid: with small and mostly white flowers sessile and usually in clusters: leaves entire, petioled, veined.

1. **C. Nuttallii,** Hook. Prostrate annual, repeatedly and divergently dichotomous: leaves ovate or rhomboid-rotund, 2 to 4 lines long and on longer petioles, with 2 or 3 pairs of strong and somewhat curving veins, and margins somewhat revolute: flowers densely clustered in the forks and at the ends of the naked branches: filaments inserted nearly in the throat of the pink or whitish corolla, the tube of which bears 5 short obtuse scales near the base: nutlets marked with a linear and rhaphe-like ventral scar. — Dry plains, from Wyoming to Washington Territory, and southward to Arizona and California.

2. HELIOTROPIUM, Tourn. Heliotrope.

Low herbs or undershrubs: the flowers almost always small. In ours the corolla is large, white, and not appendaged.

* *Fruit didymous, solid: anthers slightly cohering by their minutely bearded tips: style long and filiform; cone of the stigma truncate and bearded with a pencillate tuft of strong bristles: flowers scattered.*

1. **H. convolvulaceum,** Gray. Low spreading annual, strigose-hirsute and hoary, much branched: leaves lanceolate or sometimes nearly ovate and sometimes linear, short-petioled: flowers generally opposite the leaves and terminal, short-peduncled: limb of the corolla ample, angulate-lobed; the tube strigose-hirsute, about twice the length of the sepals. — Sandy plains, Nebraska to W. Texas and westward.

* * *Fruit 4-lobed: anthers free: style none; stigma umbrella-shaped, not surmounted by a cone: flowers in distinct unilateral scorpioid spikes.*

2. **H. Curassavicum,** L. Wholly glabrous and glaucous, diffusely spreading, a span to a foot high: leaves succulent, oblanceolate, varying from nearly linear to obovate: spikes mostly in pairs or twice forked, densely flowered: corolla white, with a yellow eye: stigma as wide as the glabrous ovary, flat. — Along the sea-coasts, also in the interior in saline soils.

3. ECHINOSPERMUM, Lehm. Stickseed.

Either pubescent or hispid: with racemose or spicate flowers, usually small, bluish or whitish. The nutlets are troublesome burs.

* *Racemes panicled, leafy-bracteate only at base, minutely bracteate or bractless above: pedicels recurved or deflexed in fruit: calyx-lobes shorter than the fruit, and at length reflexed under it: scar of the nutlets ovate or triangular: plants pubescent or hirsute, but not hispid. In ours the corolla is rotate.*

1. **E. floribundum,** Lehm. Rather strict, 2 feet or more high, or sometimes smaller: *leaves from oblong- to linear-lanceolate; the lowest tapering into*

margined petioles: racemes numerous, commonly geminate and in fruit rather strict: nutlets with elongated triangular back naked, merely scabrous; and the margin armed with a close row of flat subulate prickles, their bases often confluent. — *E. deflexum,* var. *floribundum,* Watson. From New Mexico and California northward to British America.

2. **E. ciliatum,** Gray. A foot or more high, *canescently hirsute, the hairs on the lower part of the stem retrorse: leaves tomentose-hirsute,* ciliate, *sessile, linear;* the lower 4 inches long and 2 lines wide; the upper an inch long: *racemes subcorymbose:* fruit unknown. — Proc. Am. Acad. xvii. 225. *Cynoglossum ciliatum,* Dougl. Tributaries of the Columbia and eastward to the Rocky Mountains, *Douglas.*

* * *Spikes leafy-bracteate: pedicels erect or merely spreading: calyx-lobes mostly exceeding the fruit, becoming foliaceous and often unequal: scar of the nutlets long and narrow: plants with rough or hispid pubescence: leaves linear, lanceolate, or the lower somewhat spatulate.*

3. **E. Redowskii,** Lehm. Erect, a span to 2 feet high, paniculately branched: nutlets irregularly and minutely muricately tuberculate; the margins armed with a single row of stout flattened prickles, which are not rarely confluent at base.

Var. **occidentale,** Watson. Less strict, at length diffuse, and the tubercles of the nutlets sharp instead of blunt or roundish. — Bot. King Exp. 246. From Arizona and Texas northward.

Var. **cupulatum,** Gray. Prickles of the nutlet broadened and thickened below and united into a wing or border, which often indurates and enlarges, forming a cup, with margin more or less incurved at maturity, sometimes only the tips of the prickles free. — Bot. Calif. i. 530. From Nevada to Texas and Nebraska. With the preceding form.

4. OMPHALODES, Tourn.

Ours are dwarf cespitose alpine or mountain perennials with bright blue flowers, forming the section *Eritrichium.* — Gray, Proc. Am. Acad. xx. 263.

1. **O. nana,** Gray, var. **aretioides,** Gray. Densely cespitose in pulvinate tufts, rising an inch or two above the surface, *densely villous with long soft white hairs* which are sometimes papillose-dilated at base: *leaves varying from ovate to lanceolate:* flowers terminating very short densely leafy shoots, or more racemose on developed few-leaved stems: *nutlets with a pectinate-toothed or spinulose dorsal border.* — Loc. cit. *Eritrichium nanum,* Schrad., var. *aretioides,* Herder. *E. villosum,* var. *aretioides,* Gray. Highest alpine, Colorado, Utah, Wyoming, and northward.

2. **O. Howardi,** Gray. Densely cespitose, *sericeous-canescent with appressed pubescence: leaves spatulate-linear,* 5 to 8 lines long, mostly crowded on the tufted branches of the caudex; the flowering stems 3 to 4-leaved: cyme either dichotomous or simple racemiform, few-flowered: *nutlets shining, naked, with angulate-margined dorsal border.* — Loc. cit. *Echinospermum ciliatum,* Gray, var. *Howardi,* Gray. *Cynoglossum Howardi,* Gray. Mountains of Montana and westward to the Cascades, *Howard, Canby, Tweedy.*

5. KRYNITZKIA, Fisch. & Meyer.

Annual herbs or some perennials, with white and mostly small flowers. Includes *Eritrichium* § *Krynitzkia*, and § *Eueritrichium Myosotidea*, Gray, Synopt. Fl. ii. 191. — Gray, Proc. Amer. Acad. xx. 264.

§ 1. *Nutlets more or less ovate, rugose, sometimes keeled dorsally or ventrally, attached at the base by a very small areola either to a depressed or little elevated gynobase: low and mostly diffuse or spreading annuals, sparsely or minutely hirsute: leaves linear: flowers very small (a line long).* — MYOSOTIDEA.

1. **K. Californica,** Gray. Slender, more or less hirsute: stems flowering from near the base: flowers almost sessile, most or all the lower accompanied by leaves or bracts, at length scattered: nutlets transversely rugose and minutely scabrous or smooth; the scar almost basal. — Loc. cit. 266. *Eritrichium Californicum*, DC. Spring, or muddy ground, from Wyoming and New Mexico to California and Oregon.

Var. **subglochidiata,** Gray. Slightly succulent: lower leaves inclined to spatulate: nutlets when young minutely more or less hirsute or hispid, especially on the crests of the rugosities, some of these little bristles becoming stouter and appearing glochidiate under a lens. — Bot. Calif. i. 526. Wyoming and Colorado to California.

§ 2. *Nutlets never rugose, angulate or sulcate ventrally, with convex back neither keeled nor angulate, attached from next the base to the middle or even to the apex to the elevated gynobase: corolla small, its short tube not exceeding the calyx; throat either naked or with appendages not exserted: annuals, with flowers scorpioid-spicate.* — EUKRYNITZKIA.

* *Calyx early circumscissile; the 5-cleft upper portion falling away, leaving a membranaceous base persistent around the fruit: nutlets ovate-acuminate, smooth or minutely punctilulate-scabrous, attached by a narrow groove (with transverse basal bifurcation) for nearly the whole length to the subulate gynobase: corolla with naked and open throat.*

2. **K. circumscissa,** Gray. Depressed-spreading, very much branched, an inch to a span high, whitish-hispid throughout: narrow linear leaves (¼ to ½ inch long) and very small flowers crowded, especially on the upper part of the branches. — Loc. cit. 275. *Eritrichium circumscissum*, Gray. Dry plains, Wyoming and Utah to California and Washington Territory.

* * *Calyx not circumscissile, 5-parted, conspicuously and often pungently hispid; the whole calyx (or short pedicel) often inclined to disarticulate at maturity, forming a sort of bur loosely enclosing the nutlets.*

+ *Sepals never very narrow, with a strong rigid rib: nutlets mostly dull: diffusely branching rough-hispid herbs.*

3. **K. crassisepala,** Gray. A span high, very rough-hispid: *leaves oblanceolate and linear-spatulate:* persistent calyx very hispid with yellowish or fulvous bristles; *its lobes greatly thickened below in fruit: nutlets ovate, acute, dissimilar, 3 of them muricate-granulate and one larger and smooth* or nearly so, *fixed to the conical-pyramidal gynobase from base to middle.* — Loc. cit. 268. *Eritrichium crassisepalum*, Torr. & Gray. From New Mexico and W. Texas to Nebraska and the Saskatchewan.

4. **K. Pattersoni,** Gray. About a foot high, rough-hispid: *leaves narrowly spatulate or linear:* calyx hispid with pungent bristles; *its lobes linear-lanceolate, less thickened: nutlet (usually only one maturing) ovate-acuminate, smooth, attached from base to middle to the subulate-pyramidal gynobase.* — Loc. cit. 268. At the base of the Rocky Mountains in Colorado, *Patterson, Hooker & Gray.*

5. **K. Fendleri,** Gray. Erect, hardly a foot high, paniculately branched, rather rigid: as in the last, but *leaves linear, sepals narrowly linear, nutlets more attenuate upwards and attached almost to the apex to the narrowly subulate gynobase.* — Loc. cit. 268. Heretofore confounded with *K.* (*Eritrichium*) *leiocarpa.* From the Saskatchewan to Colorado and New Mexico.

+– +– *Sepals narrow, neither thickened nor with prominent rib: nutlets very smooth, shining: erect slender herbs, somewhat hispid.*

6. **K. Watsoni,** Gray. A foot high: sepals of fruiting calyx scarcely 2 lines long, lanceolate, sparsely setose-hispid: nutlets (a line long) narrow, subtriquetrous, about oblong-lanceolate in outline, attached almost the whole length to the filiform-subulate gynobase. — Loc. cit. 271. Wahsatch Mountains, Utah, *Watson.* A part of *Eritrichium leiocarpum,* Bot. King Exped.

§ 3. *Nutlets triquetrous or three-angled, with acute lateral angles, attached to a mostly subulate gynobase: generally biennial or perennial herbs: corolla with throat appendages prominent or exserted.* — PSEUDOKRYNITZKIA. *Ours are stout, with rather broad leaves, and flowers thyrsoid-congested.*

* *Fruit depressed-globose.*

7. **K. Jamesii,** Gray. A span or two high, branched from the hard or woody base, canescently silky-tomentose and somewhat hirsute, becoming even hispid in age: leaves oblanceolate or the upper linear: spikes somewhat panicled or thyrsoid-crowded: fruiting calyx mostly closing over the fruit, which consists of four very smooth and shining broadly triangular (¼ globe) nutlets. — Loc. cit. 278. *Eritrichium Jamesii,* Torr. From Texas to S. California and northward to Wyoming.

* * *Fruit more or less pyramidal.*

+– *Tube of the corolla not longer than the calyx and little if any longer than the lobes: a ring of* 10 *small scales or glands above the base within.*

8. **K. virgata,** Gray. *Very hispid, not at all canescent:* stem strict, a foot or two high, *flowering for most of its length in short and dense nearly sessile clusters, which are generally much shorter than the elongated linear subtending leaves,* and forming a long virgate leafy spike: nutlets broad ovate, *sparingly papillose on the back.* — Loc. cit. 279. *Eritrichium glomeratum,* var. *virgatum,* Porter. Eastern slopes of the Rocky Mountains in Colorado.

9. **K. glomerata,** Gray. *Grayish-hirsute and hispid,* a foot or more high: *leaves spatulate or linear-spatulate:* inflorescence thyrsiform and mostly dense: calyx very setose-hispid: nutlets ovate, *more or less tuberculate-rugose on the back.* — Loc. cit. 279. *Eritrichium glomeratum,* DC. From Arizona and New Mexico to the Saskatchewan and Washington Territory.

10. **K. sericea,** Gray. *Barely a span high, pubescence less hispid and generally canescent,* at least the lower leaves, *these spatulate: thyrsus spiciform:* pubescence and bristles of the calyx either whitish or tawny yellow: nutlets

oblong-ovate, somewhat rugose-tuberculate on the back. — Loc. cit. 279. — *Eritrichium glomeratum*, var. *humile*, Gray. Alpine and subalpine, from Colorado and Utah to Montana and Oregon.

+ + *Tube of the salverform corolla longer than the calyx and* 2 *or* 3 *times the length of the lobes: the ring inconspicuous, its glands indistinct: silky-canescent, and with contracted thyrsoid inflorescence.*

11. **K. fulvocanescens,** Gray. A span or so high, cespitose: leaves linear-spatulate or oblanceolate, silky-strigose or even tomentose; the lower with bright white and soft hairs; the upper and the thyrsoid glomerate inflorescence and calyx with fulvous-yellow more hirsute hairs and some hispid bristles: nutlets ovate, more or less papillose or tuberculate-rugose on the back. — Loc. cit. 280. *Eritrichium fulvocanescens*, Gray. Mountains of Texas and New Mexico to those of Nevada and Wyoming.

6. MERTENSIA, Roth. Lungwort.

Either glabrous or with some pubescence: the leaves usually broad, and the lowermost petioled: the flowers usually showy, blue, purple, or rarely white, paniculate-racemose or cymose. — In our species the corolla has a conspicuously 5-lobed limb, with small crests in the throat.

* *Filaments enlarged, as broad as the anthers, always inserted in the throat of the corolla: style long and capillary, generally somewhat exserted.*

+ *Tube of the corolla twice or thrice the length of the limb and of the calyx.*

1. **M. oblongifolia,** Don. A span or so high, smooth or nearly so: leaves mostly oblong or spatulate-lanceolate, rather succulent: flowers in a somewhat close cluster: lobes of the calyx lanceolate or linear, mostly acute. — From British Columbia southward, through the mountains of Montana to Utah and Arizona.

+ + *Tube of the corolla little or not twice longer than the throat and limb.*

2. **M. Sibirica,** Don. *Stems tall,* 1 *to* 5 *feet high; pale and glaucescent, glabrous and smooth* or nearly so, *very leafy:* leaves ample, veiny; cauline leaves oblong- or lanceolate-ovate, hirsute-ciliate; *the upper with very acute or acuminate apex;* the lowest ovate or subcordate (3 *or* 4 *inches long*): short racemes panicled: *calyx-lobes oblong or oblong-linear, obtuse,* commonly ciliolate, ½ *or* ¼ *the length of the tube* of the bright light-blue corolla. — From the mountains of Colorado westward to the Sierra Nevada, and far northward.

3. **M. paniculata,** Don. *Greener, roughish and more or less pubescent:* size and leaves about as in the last: racemes loosely panicled: *calyx-lobes lanceolate or linear and mostly acute, hispid-ciliate or hirsute, equalling or only* ½ *shorter than the tube* of the purple-blue corolla. — From Nevada and Utah to Hudson's Bay and northward.

4. **M. lanceolata,** DC. Either glabrous or hirsute-pubescent, simple or paniculately branched: *stems a span to a foot high: leaves pale or glaucescent, from spatulate-oblong to lanceolate-linear,* 1 *or* 2 *inches long, obtuse or barely acute:* racemes at length loosely panicled: calyx-lobes lanceolate, acute or obtuse, ciliate or hirsute or glabrous, more or less shorter than the tube of the blue

corolla, which is hairy near the base within. — From Dakota and Wyoming to New Mexico.

Var. **Fendleri,** Gray. A commonly hirsute form, with calyx 5-cleft only to the middle. — Proc. Am. Acad. x. 52.

* * *Filaments narrower than the anthers, inserted either on the margin of the throat or about the middle of the tube: style included.*

5. **M. alpina,** Don. A span or more high, either nearly glabrous or pubescent: leaves oblong, somewhat spatulate or lanceolate, rather obtuse; the cauline sessile (1 or 2 inches long): flowers in a close or at length loose cluster: calyx-lobes equalling or rather shorter than the tube of the corolla: anthers nearly sessile. — High elevations in mountains of Colorado and Utah.

7. MYOSOTIS, L. Forget-me-not.

Low and spreading pubescent herbs, with sessile stem leaves and small blue flowers in bractless racemes. In ours the calyx is beset with hairs, some of them bristly and having minutely hooked tips.

1. **M. sylvatica,** Hoffm. Hirsute-pubescent, either green or cinereous: leaves oblong-linear or lanceolate; the radical conspicuously petioled: pedicels as long as the calyx or longer: calyx-lobes erect or slightly closing in fruit: nutlets more or less margined and carinate ventrally at the apex.

Var. **alpestris,** Koch. Stems tufted, 3 to 9 inches high: racemes more dense: pedicels shorter and thicker, seldom longer than the calyx. — In high alpine regions in the mountains of Colorado and Wyoming, and northward.

8. LITHOSPERMUM, Tourn. Gromwell.

Herbs with reddish roots, sessile leaves, and axillary or subaxillary or leafy-bracted flowers: stamens with very short filaments, and nutlets (in ours) white, smooth and polished.

* *Flowers rather small: corolla greenish-yellow, short; its tube hardly if at all longer than the calyx, nearly naked at the throat.*

1. **L. pilosum,** Nutt. Soft-hirsute and pubescent, pale or canescent: stems numerous from a stout root, a foot high, mostly simple, very leafy: leaves linear and linear-lanceolate, mostly tapering from near the base to apex: flowers densely crowded in a leafy thyrsus: corolla campanulate-funnelform, almost ½ inch long, silky outside. — From British Columbia and Montana to Utah and California.

* * *Flowers mostly showy: corolla yellow, much exceeding the calyx; pubescent crests in the throat apparent. Plants with long and deep red roots* (Puccoon).

← *Corolla light yellow: later floral leaves reduced to bracts, not surpassing the calyx.*

2. **L. multiflorum,** Torr. Minutely strigose-hispid: stems virgate, a foot or two high: leaves linear or linear-lanceolate: flowers numerous, short-pedicelled, the latter spicate: corolla narrow (5 or 6 lines long), with very short rounded lobes and tube fully twice the length of the calyx; the crests or folds in the throat inconspicuous. — In the mountains from Colorado to Arizona and Texas.

+ + *Corolla bright and deep yellow or orange; the tube from ½ to twice longer than the calyx, and the crests at the throat little if at all projecting or arching: floral leaves or foliaceous bracts large, much surpassing the calyx.*

3. **L. canescens,** Lehm. *More or less canescent* when young: stem hirsute, a span to a foot or more high: leaves oblong-linear or the upper varying to ovate-oblong, mostly obtuse, *softly silky-pubescent, greener with age but not rough:* corolla orange-yellow, and *glandular ring at the base naked: flowers nearly sessile.* — From Arizona and New Mexico to the Saskatchewan, Upper Canada, and Alabama. "Puccoon" of the Indians.

4. **L. hirtum,** Lehm. *Hispid or hirsute and at length rough,* a foot or two high: leaves lanceolate or the lower linear and floral ovate-oblong: corolla bright orange; *the ring at the base within bearing* 10 *very hirsute lobes or teeth: flowers mostly pedicelled.* — From Colorado to Minnesota and Florida.

+ + + *Corolla bright yellow, salverform; its tube in well-developed flowers* 2 *to* 4 *times the length of the calyx; the crests in the throat conspicuous and arching.*

5. **L. angustifolium,** Michx. Erect or diffusely branched from the base, a span to a foot or more high, minutely scabrous-strigose and somewhat cinereous: leaves all linear: flowers pedicelled, leafy-bracted, of two sorts; the earlier and conspicuous kind with corolla tube an inch or less in length; the later ones, and those of diffusely branching plants, with inconspicuous or small and pale corolla, without crests in the throat, probably cleistogenous. — From Utah and Arizona to Texas, Wisconsin, and the Saskatchewan.

9. ONOSMODIUM, Michx.

Rather stout and coarse, rough-hispid or hirsute, with leafy-bracteate flowers crowded in scorpioid spikes or racemes; the bracts resembling leaves: corolla greenish-white or yellowish-green; a glandular 10-lobed ring adnate to the base of the tube within. In ours the corolla is seldom twice the length of the calyx, and the leaves are pinnately nervose-ribbed.

1. **O. Carolinianum,** DC. Stout, 2 or 3 feet high, shaggy-hispid: leaves ovate-lanceolate and oblong-lanceolate, acute, 5 to 9-ribbed, generally hairy both sides: flowers nearly sessile: corolla lobes very hairy outside. — Colorado and eastward.

Var. **molle,** Gray. A foot or two high: the pubescence shorter and less spreading or appressed: leaves mostly smaller (2 inches long), when young softly strigose-canescent beneath. — Synopt. Fl. ii. 206. *O. molle,* Michx. From Utah to Texas, Illinois, and the Saskatchewan.

ORDER 54. CONVOLVULACEÆ. (CONVOLVULUS FAMILY.)

Chiefly twining or trailing herbs, with alternate leaves (or scales) and regular 5-androus flowers; a calyx of 5 imbricated sepals; a 5-plaited or 5-lobed corolla convolute or twisted in the bud; a 2-celled ovary, with a pair of ovules in each cell, the cells sometimes doubled by a false partition. In ours the ovary is entire.

Tribe I. Plants with ordinary foliage, not parasitic.

1. **Ipomœa.** Style undivided, terminated by a single capitate or globose stigma. Corolla from salverform or funnelform to nearly campanulate.
2. **Convolvulus.** Style undivided or 2-cleft only at the apex: stigmas 2, from linear-filiform to subulate or ovate. Corolla from funnelform to campanulate.
3. **Evolvulus.** Styles 2, distinct or sometimes united below, each 2-cleft: stigmas linear-filiform or somewhat clavate. Corolla from funnelform to almost rotate.

Tribe II. Leaflets parasitic twining herbs, destitute of foliage and of all green color.

4. **Cuscuta.** Corolla imbricated in the bud, appendaged below the stamens.

1. IPOMŒA, L. Morning-Glory.

Calyx not bracteate at base, but the outer sepals commonly larger: limb of corolla entire, or barely angulate or lobed.

1. **I. leptophylla,** Torr. Very glabrous: stems erect or ascending (2 to 4 feet high) from an immense root, with recurving slender branches: leaves linear (2 to 4 inches long), short-petioled, acute: peduncle short, 1 or 2-flowered: outer sepals shorter: corolla pink-purple, funnelform, about 3 inches long: seeds rusty-pubescent. — Frem. Rep. 95. Plains of Nebraska and Wyoming to Texas and New Mexico.

2. CONVOLVULUS, L. Bindweed.

Twining or prostrate, with small or large flowers. Includes *Calystegia.*

* *Stigmas from ovate or oval to oblong, very flat: solitary flower involucellate by a pair of persistent broad bracts, which are close to the calyx and enclose or exceed it.*

1. **C. sepium,** L. Glabrous or pubescent, freely twining: leaves slender-petioled, deltoid-hastate and triangular-sagittate (2 to 5 inches long), acute or acuminate; the basal lobes or auricles either entire or angulate 2 to 3-lobed: peduncles mostly elongated: bracts cordate-ovate or somewhat sagittate, commonly acute: corolla broadly funnelform, 2 inches long, white or tinged with rose-color. — *Calystegia sepium,* R. Br. From Utah to Canada and the N. Atlantic States.

Var. **Americanus,** Sims. Corolla pink or rose-purple: bracts obtuse. — From Oregon to Canada and Carolina.

Var. **repens,** Gray. Corolla from almost white to rose-color: bracts from very obtuse to acute: herbage from minutely to tomentose-pubescent: sterile and sometimes flowering stems extensively prostrate: leaves more narrowly sagittate or cordate, the basal lobes commonly obtuse or rounded and entire. — Synopt. Fl. ii. 215. *Calystegia sepium,* var. *pubescens,* Gray. From New Mexico to Texas, Dakota, and eastward.

* * *Stigmas filiform or narrowly linear: no bracts at or near the base of the calyx.*

2. **C. incanus,** Vahl. Cinereous or canescent with a close and short silky pubescence: stems filiform, 1 to 3 feet long, mainly procumbent: leaves polymorphous; some simply lanceolate- or linear-sagittate or hastate, obtuse and mucronate, entire, and with the narrow elongated basal lobes entire or 2

to 3-toothed; some pedate, having narrowly 2 to 3-cleft lateral lobes or divisions; some more coarsely 3 to 5-parted, with lobes entire or coarsely sinuate-dentate: peduncles 1 to 2-flowered, as long as the leaf: corolla white or tinged with rose, ½ inch long, the angles salient-acuminate. — Includes *C. lobatus*, Eng. & Gray. S. Colorado and Arkansas to Texas and Arizona.

3. EVOLVULUS, L.

Low and small rather suffrutescent plants, with erect or diffuse or prostrate (never twining) stems, entire leaves, one to few-flowered peduncles, and small purple or blue almost rotate corolla. Our species has both sides of the leaves, stems, and calyx densely silky-villous.

1. **E. argenteus,** Pursh. Stems numerous from a lignescent base, rather stout and rigid, erect or ascending, a span or so high, very leafy: dense pubescence sometimes silvery-canescent, usually fulvous or ferruginous: leaves from spatulate and obtuse to linear-lanceolate and acute: pedicels very short. — Plains and prairies, from Nebraska to Wyoming, Colorado, and southward.

4. CUSCUTA, Tourn. DODDER.

Flowers 5- (rarely 4-) merous: calyx cleft or parted: corolla globular-urn-shaped, bell-shaped, or somewhat tubular: stamens inserted in the throat of the corolla above as many scale-like lacerate appendages: ovary globular, 2-celled, 4-ovuled: styles (in ours) distinct and terminated by peltate-capitate stigmas: embryo thread-shaped, spirally coiled, destitute of cotyledons. — Leafless thread-like stems yellowish or reddish in color, bearing a few minute scales instead of leaves: flowers small, cymose-clustered, mostly white.

* *Capsule indehiscent.*

+ *Calyx gamosepalous.*

++ *Ovary and capsule depressed-globose: flowers in dense or globular clusters: corolla with a short and wide tube, in age remaining at the base of the capsule: styles mostly shorter than the ovary.*

1. **C. arvensis,** Beyrich. Stems pale and slender, low: flowers scarcely a line long: calyx-lobes obtuse, mostly very broad: those of the corolla acuminate, longer than the tube, with inflexed points: scales large, deeply fringed. — In rather dry soil, on various low plants, across the continent. The var. *pentagona*, found in Colorado, has a large and angled calyx.

++ ++ *Ovary and capsule pointed; the latter enveloped or capped by the marcescent corolla: flowers in paniculate cymes.*

= *Acute tips of corolla-lobes inflexed or corniculate.*

2. **C. decora,** Choisy. Stems coarse: flowers fleshy and more or less papillose: lobes of the calyx triangular, acute: those of the broadly campanulate corolla ovate-lanceolate, minutely crenulate, *spreading: scales large, deeply fringed: capsule enveloped by the remains of the corolla.*

Var. **pulcherrima,** Engelm. A larger form, with coarse stems, and *conspicuous flowers* 1½ *to* 2½ *lines long and wide:* anthers and stigmas yellow or deep purple. — On herbs and low shrubs in wet prairies, principally *Legumi-*

nosæ and *Compositæ*. Across the continent, principally through its southern borders.

3. **C. inflexa,** Engelm. Like the last: flowers of the same structure, but *only a line long*, generally 4-merous; corolla deeper, *with erect lobes, finally capping the capsule: scales reduced to a few teeth.* — Open woods and dry prairies, on shrubs (hazels, etc.) or coarse herbs, from Arkansas to Dakota and eastward.

= = *Obtuse lobes of the corolla spreading.*

4. **C. Gronovii,** Willd. Stems coarse, often climbing high: corolla-lobes mostly shorter than the deeply campanulate tube: scales copiously fringed: capsule globose, umbonate. — In wet shady places from the Rocky Mountains eastward, most abundant in the Atlantic States, and everywhere very variable.

+ + *Calyx of 5 distinct and largely overlapping sepals, surrounded by 2 to 5 or more similar bracts: scales of corolla large and deeply fringed: capsule mostly one-seeded, capped by the marcescent corolla: flowers on bracteolate pedicels, in loose panicles.*

5. **C. cuspidata,** Engelm. Stems slender: flowers 1½ to 2½ lines long, thin, membranaceous when dry: bracts and sepals ovate-orbicular: oblong lobes of the corolla cuspidate or mucronate, rarely obtuse, shorter than the cylindrical tube: styles many times longer than the ovary, at length exserted. — Prairies, on *Ambrosia*, *Iva*, *Leguminosæ*, etc., from Colorado to Texas and Nebraska.

* * *Capsule more or less regularly circumscissile, usually capped by the remains of the corolla: styles capillary and lobes of the corolla acute.*

6. **C. umbellata,** HBK. Stems low and capillary: flowers 1½ to 2 lines long, few together in umbel-like clusters, usually shorter than their pedicels: acute calyx-lobes and lanceolate-subulate lobes of the corolla longer than its shallow tube: scales deeply fringed and exceeding the tube. — Dry places, on low herbs (*Portulaca*, etc.), from S. E. Colorado to Texas and Arizona.

Order 55. **SOLANACEÆ.** (Nightshade Family.)

Herbs, with alternate leaves, regular 5-merous and 5-androus flowers, on bractless pedicels; the corolla variously arranged in the bud, and mostly plaited. Stamens mostly equal and all perfect, inserted on the corolla. Style and stigma single.

* Fruit a berry.

+ Anthers longer than their filaments, either connivent or connate into a cone or cylinder: corolla rotate: calyx mostly unchanged in fruit.

1. **Solanum.** Anther-cells opening at the apex by a pore or short slit, and sometimes also longitudinally dehiscent.

+ + Anthers unconnected, mostly shorter than their filaments, destitute of terminal pores, dehiscent longitudinally.

2. **Chamæsaracha.** Calyx herbaceous and closely investing the fruit or most of it, not angled. Corolla rotate, 5-angulate. Berry globose, its summit usually more or less naked. Pedicels solitary in the axils, refracted or recurved in fruit.

3. **Physalis.** Calyx becoming much enlarged and membranaceous-inflated, completely and loosely enclosing the fruit, reticulate-veiny and 5-angled or 10-costate. Corolla rotate or rotate-campanulate, 5-angulate or obscurely 5-lobed. Berry juicy. Pedicels solitary.

* * Fruit a capsule.[1]

4. **Nicotiana.** Corolla funnelform or salverform. Filaments mostly included. Ovary normally 2-celled, with large and thick placentæ, bearing very numerous ovules and seeds. The fruit more or less invested by the persistent calyx, septicidal and also usually loculicidal at summit: the valves or teeth becoming 4.

1. SOLANUM, Tourn. NIGHTSHADE, etc.

Herbs of various habit: flowers cymose, mostly after the scorpioid manner.

* *Fruit naked, i. e. not enclosed in the enlarged calyx: stamens all alike, and anthers blunt.*

+ *Tuberiferous perennial, pinnate-leaved.*

1. **S. Jamesii,** Torr. A span or so in height: leaflets 5 to 9, varying from lanceolate to ovate-oblong, smoothish; the lowest sometimes much smaller, but no interposed small ones: peduncle cymosely few to several-flowered: corolla white, at length deeply 5-cleft. — Ann. Lyc. N. Y. ii. 227. Mountains of Colorado to New Mexico and Arizona. Very closely allied to *S. tuberosum*, var. *boreale*, Gr., of New Mexico and southward, the *S. Fendleri* of the earlier reports.

+ + *Annuals, simple-leaved, never prickly, but the angles of the stem sometimes rough.*

2. **S. triflorum,** Nutt. Green, slightly hairy or nearly glabrous, low and much spreading: *leaves oblong, deeply pinnatifid*, with wide rounded sinuses; the lobes 7 to 9, lanceolate, entire, or sometimes 1 or 2-toothed: *peduncles lateral, 1 to 3-flowered:* pedicels nodding: corolla small, white, a little longer than the 5-parted calyx: *berries green, as large as a small cherry.* — On the plains from New Mexico to the Saskatchewan, chiefly as a weed in cultivated ground.

3. **S. nigrum,** L. Low, green and almost glabrous, or the younger parts pubescent: *leaves mostly ovate with a cuneate base, irregularly sinuate-toothed, repand, or sometimes entire*, acute or acuminate: *flowers in small peduncular umbel-like lateral cymes:* calyx much shorter than the corolla, which is white or bluish: *berries usually black when ripe, only as large as peas.* — Found everywhere, especially in damp or shady ground, and including many varieties.

* * *Fruit enclosed by the close-fitting and horridly prickly calyx and even adhering to it: stamens and especially the style much declined: anthers tapering upwards, dissimilar; the lowest one much longer and larger, and with an*

[1] The genus *Datura*, containing several introduced species within our range, may be recognized by its prismatic 5-toothed calyx, funnelform corolla, and prickly mostly 4-celled 4-valved capsule. — They are rank weeds, with ovate leaves, and large and showy flowers on short peduncles in the forks of the branching stem. Known as "Jamestown Weed" or "Thorn Apple." For species see p. 270, foot-note.

incurved beak: leaves 1 *to* 3*-pinnatifid: annuals, armed with straight prickles.*

4. **S. heterodoxum,** Dunal. *Pubescent with glandular-tipped simple hairs,* with a very few 5-rayed bristly ones on the upper face of the irregularly or interruptedly bipinnatifid leaves; their lobes roundish or obtuse and repand: *corolla violet,* 1½ inches or less in diameter, somewhat irregular, 5-cleft; *the lobes ovate-acuminate:* four anthers yellow and the large one tinged with violet. — On the plains from Colorado to New Mexico and Texas.

5. **S. rostratum,** Dunal. *Somewhat hoary or yellowish with a copious wholly stellate pubescence,* a foot or two high: leaves nearly as in the last or less divided, some of them only once pinnatifid: *corolla yellow,* about an inch in diameter, hardly irregular, *the short lobes broadly ovate.* — On the plains from Nebraska to Texas and westward to the mountains.

2. CHAMÆSARACHA, Gray.

Depressed plants; with narrow entire or pinnatifid leaves tapering into margined petioles, filiform naked pedicels, the calyx close-fitting in fruit, almost globose.

1. **C. Coronopus,** Gray. Green, almost glabrous, or beset with some short and roughish hairs, diffusely very much branched: leaves lanceolate or linear with cuneate-attenuate base, varying from nearly entire to laciniate-pinnatifid: peduncles elongated: calyx more or less hirsute, the hairs often 2-forked at tip: corolla yellowish: berry nearly white. — Bot. Calif. i. 540. *Withania* (?) *Coronopus,* Torr. From S. Colorado to Texas and Arizona.

3. PHYSALIS, L. Ground Cherry.

Herbs, with entire, toothed, or lobed leaves, and solitary or sometimes 2 or 3 drooping or nodding pedicels · the flowers white, yellow, or violet-purple: berries greenish, red, or yellow.

* *Young parts sparsely* (*or on stalks and calyx densely*) *scurfy-granuliferous, otherwise quite glabrous: some leaves sinuate-pinnatifid: corolla flat-rotate.*

1. **P. lobata,** Torr. Low and small, diffusely branched: leaves oblong-spatulate or obovate, from repand to sinuate-pinnatifid, the base cuneately tapering into a margined petiole: corolla violet, the centre with a 5 to 6-rayed white-woolly star. — On the plains, from Colorado to Arizona and Texas.

* * *Not granulose-scurfy: leaves never pinnatifid: corolla mostly rotately spreading from a somewhat campanulate throat or base, greenish white or yellow.*

+ *Annuals, glabrous or nearly so, the pubescence if any minute, and neither viscid nor stellate: anthers violet: berry greenish yellow: stem and branches conspicuously angular.*

2. **P. angulata,** L. Erect, or at length declined or spreading, 2 to 4 feet long: leaves mostly ovate-oblong and with somewhat cuneate base, coarsely and laciniately toothed: corolla 3 to 6 lines broad, with no distinct eye: fruiting calyx at first ovate-pyramidal and 10-angled, the 5 principal angles sharply keeled, at full maturity nearly replete and globose-ovate. — From Colorado eastward to the Atlantic States.

+ + *Strong-scented, villous or pubescent with viscid or glandular simple hairs: fruiting calyx ovate-pyramidal and carinately 5-angled at maturity, loosely enveloping the green or at length yellow berry: leaves ovate or cordate.*

3. **P. pubescens,** L. *Annual,* a foot or two high, with at length widely spreading branches: leaves varying from nearly entire to coarsely and obtusely repand-toothed, sometimes becoming nearly glabrous except on the midrib and veins: *corolla about ½ inch in diameter when expanded, dull yellow with a purplish brown eye: anthers violet: pedicels 3 to 5 lines long:* fruiting calyx mostly pubescent and viscid. — From California to Colorado and Texas, thence eastward to New York and Florida.

4. **P. Virginiana,** Mill. *Perennial,* a foot or so high, *from slender and deep creeping subterranean shoots,* at length spreading or decumbent, pubescent or hirsute-villous with many-jointed hairs: leaves either repandly or saliently few-toothed or some nearly entire: *corolla from ¾ to 1 inch in diameter, dull sulphur-yellow with a brownish centre: anthers yellow: pedicels ½ to 1 inch long.* — *P. viscosa* of Gray's Manual. From Colorado eastward across the continent.

+ + + *Perennials, not viscid, the pubescence more or less stellular, mostly low: anthers almost always yellow.*

5. **P. Fendleri,** Gray. *Pruinose-puberulent; the pubescence microscopically minute* and partly simple, partly branched or stellular, sometimes a little glandular: stems a span to a foot high from a deep tuberous stock, much branched: *leaves small, from deltoid-ovate or slightly cordate to ovate-lanceolate, with abrupt base,* and from repand-undulate to coarsely sinuate-toothed: corolla ½ inch in diameter. — Proc. Am. Acad. x. 65. S. Colorado and New Mexico.

6. **P. lanceolata,** Michx. *More or less hirsute-pubescent with short and stiff tapering hairs,* most of which are simple, a few 2 to 3-forked, varying to nearly glabrous: stems a span to a foot high. angled, somewhat rigid: *leaves* pale green, *varying from oblong-ovate to narrowly lanceolate, acute at base or tapering into a short petiole,* and from sparingly angulate-few-toothed to undulate or entire: corolla ochroleucous with more or less dark eye, ⅔ to ¾ inch in diameter. — *P. Pennsylvanica,* Gray Man., in part. On the plains from New Mexico, Colorado, and Utah, eastward to Florida and Lake Winnipeg.

Var. **lævigata,** Gray. Glabrous or almost so throughout, or with some extremely short and pointed appressed rigid hairs on young parts, calyx, etc., or on the margin of the leaves. — From Nebraska to Texas and westward to New Mexico and Arizona.

4. NICOTIANA,[1] Tourn. TOBACCO.

Heavy-scented and usually viscid-pubescent herbs; with mostly entire leaves, and paniculate or racemose flowers.

[1] The two introduced species of *Datura* may be distinguished as follows: —

D. Stramonium, L., the common Jamestown (vulgarized to "Jimson") Weed, is green and glabrous, 1 to 4 feet high; has sinuately and laciniately angled and toothed leaves, a white corolla about 3 inches long, and an erect capsule thickly armed with short stout prickles.

D. discolor, Bernh., probably from Mexico, is low and more or less cinereous-pubescent; has leaves like the last, but the white corolla is tinged with purple and perhaps smaller, and the nodding globose capsule and its stout large prickles are pubescent.

1. **N. attenuata,** Torr. A foot or two high: *leaves all on naked and mostly slender petioles* and acute or merely obtuse at base; the lower ovate or oblong; the upper from oblong-lanceolate and attenuate-acuminate to linear-lanceolate or linear: *corolla* dull white or greenish, *slender salverform, not enlarged at the throat; the tube* 1 *to* 1½ *inches long; the obscurely* 5*-lobed limb* 4 *to* 6 *lines in diameter: filaments equally inserted low down on the tube.* — In dry ground, from Colorado to Nevada and California.

2. **N. quadrivalvis,** Pursh. A foot high, rather stout: leaves oblong or the uppermost lanceolate, and the lower ovate-lanceolate, acute at both ends, *mostly sessile:* flowers few: *corolla* white, *tubular-funnelform and open-mouthed; the tube barely an inch long; the* 5*-lobed limb* 1½ *inches or more in diameter: filaments unequally inserted in the upper part of the tube:* capsule 4-celled. — A native of Oregon, but cultivated by the Indians to the Missouri: their most prized tobacco-plant.

Order 56. **SCROPHULARIACEÆ.** (Figwort Family.)

Chiefly herbs with didynamous or diandrous stamens inserted on the tube of the 2-lipped or more or less irregular corolla: fruit a 2-celled and usually many-seeded pod. Style single: stigma entire or 2-lobed.

I. Leaves prevailingly opposite, at least the lower: upper lips or lobes of the corolla external in the bud. — Antirrhinideæ.

* Corolla bilabiate and more or less tubular; the base of the tube gibbous or spurred on the lower side, and the lower lip often with an intrusion (palate) at the throat: stamens 4, with 2-celled anthers: capsule opening by irregular perforations or chinks: inflorescence simple and racemose.

1 **Linaria.** Corolla with a spur at base and a prominent palate nearly closing the throat.

* * Corolla more or less bilabiate and tubular, not saccate or otherwise produced at base anteriorly: stamens 4, with usually a rudiment of the fifth present: capsule dehiscent by valves: inflorescence normally compound.

← Corolla gibbous or saccate on the upper or posterior side of the tube: ovules and seeds few or solitary in the cells: calyx deeply 5-cleft: flowers solitary or umbelliform-verticillate.

2. **Collinsia.** Corolla deeply bilabiate; its upper lip 2-cleft, with lobes more or less erect; lower larger and 3-lobed; its lateral lobes pendulous-spreading; middle one conduplicate into a keel-shaped sac which encloses the 4 declined stamens and style. Anterior pair of filaments inserted higher than the other: anther-cells confluent at the apex. A gland at base of corolla represents the fifth stamen. Leaves undivided.

← ← Corolla-tube not gibbous posteriorly: ovules and seeds indefinitely numerous: calyx deeply 5-parted or of distinct sepals: inflorescence mostly thyrsoidal.

3. **Scrophularia.** Corolla short; the tube ventricose and globular or oblong; lobes 5, unequal, 4 erect and the fifth reflexed or spreading. Sterile stamen represented by a scale on the upper side of the corolla: anthers transverse and confluently 1-celled.

4. **Pentstemon.** Corolla from ventricose campanulate to elongated-tubular; the limb either obscurely or strongly bilabiate. Sterile stamen represented by a conspicuous and elongated filament: anther-cells either united or confluent at apex.

← ← ← Corolla-tube not gibbous: ovules and seeds rather numerous: calyx not deeply cleft: inflorescence simply spicate.

5. **Chionophila.** Calyx funnelform. Corolla tubular, with slightly dilated throat and bilabiate limb; upper lip erect, barely 2-lobed, the sides somewhat recurved; lower

with convex densely bearded base forming a palate, and 3-lobed. Sterile filament small and short: anther-cells divaricate and confluent.

* * * Corolla from bilabiate to almost regular, not saccate or otherwise produced at base: antheriferous stamens 2 or 4, with no rudiments of the fifth: capsule dehiscent, many-seeded: inflorescence simple; the pedicels solitary in the axil of bracts or leaves.

+ Calyx prismatic and barely 5-toothed: corolla more or less bilabiate: stamens 4.

6. **Mimulus.** Corolla with either elongated or short tube; upper lip 2-lobed, and the lower 3-lobed; a pair of palatine ridges running down the lower side of the throat. Anthers generally approximate in pairs; their cells divergent.

+ + Calyx 5-parted or deeply 4 to 5-lobed: corolla bilabiate: antheriferous stamens 2.

7. **Gratiola.** Corolla with cylindraceous tube and lips of nearly equal length; the upper entire or lobed; the lower 3-cleft. The posterior pair of stamens antheriferous; the anterior pair sterile rudiments.

+ + + Calyx and corolla both 5-lobed and nearly regular: stamens 4, nearly equal: no sterile filament.

8. **Limosella.** Calyx campanulate. Corolla between rotate and campanulate. Anthers one-celled by confluence.

II. Leaves various: lower lip or lateral lobes of the corolla external in the bud.

* Corolla little if at all bilabiate; the lobes all plane, the lateral or one of them external: stamens 2, exserted: anther-cells contiguous at apex and often confluent: hypogynous disk mostly conspicuous: none parasitic.

9. **Synthyris.** Corolla from oblong- to short-campanulate, 4-cleft, more or less irregular, occasionally wanting. Sepals 4. Anther-cells parallel or divergent below, not confluent at apex. Capsule emarginate.

10. **Veronica.** Corolla (in ours) rotate with very short or hardly any tube; its lobes 4 (sometimes 5), one usually smaller. Anther-cells more or less confluent. Capsule compressed, from emarginate to obcordate or 2-lobed.

* * Corolla little or not at all bilabiate; the lobes all plane, the anterior one external: stamens 4, conspicuously didynamous, shorter than the corolla; anther-cells distinct to the very apex: most of them partially root parasitic; the foliage turning black in drying.

11. **Gerardia.** Corolla from campanulate to funnelform; the throat enlarged; limb 5-parted, and with the 2 posterior lobes often rather smaller or more united. Calyx campanulate, 5-toothed or 5-cleft. Anthers more or less approximate in pairs.

* * * Corolla manifestly bilabiate; the upper lip erect and concave or galeate, entire or emarginate, rarely 2-cleft; the lower 3-cleft, external in the bud: stamens 4 and didynamous, or rarely 2, ascending under the upper lip; anther-cells distinct: some of them partially root-parasitic.

+ Anther-cells unequal or dissimilar; the outer one affixed by its middle; the other pendulous from its upper end, mostly smaller, sometimes sterile or deficient: leaves alternate or only the lowest opposite.

12. **Castilleia.** Calyx tubular, laterally flattened, more or less cleft anteriorly or posteriorly, or both. Corolla tubular, more or less laterally compressed, especially the elongated and conduplicate or carinate-concave and entire upper lip; lower lip short and small, 3-toothed, 3-carinate or somewhat saccate below the teeth; the tube usually enclosed in the calyx. Stamens 4, all with 2-celled anthers.

13. **Orthocarpus.** Calyx tubular-campanulate, 4-cleft, or cleft anteriorly and posteriorly and the divisions 2-cleft or parted. Corolla mostly with slender tube; upper lip little longer and usually much narrower than the inflated 1 to 3-saccate lower one. Stamens 4: the smaller anther-cell sometimes wanting.

14. **Cordylanthus.** Calyx spathaceous, diphyllous, or by the absence of the anterior division monophyllous. Corolla tubular, with lips commonly of equal length; the upper as in *Orthocarpus;* the lower 3-crenulate or entire. Stamens 4, or sometimes the shorter pair wanting: anther-cells either ciliate or minutely bearded at base and apex. Style hooked at tip.

← ← Anther-cells equal, parallel and alike in all 4 stamens.

15. **Pedicularis.** Calyx various, cleft anteriorly and sometimes posteriorly. Corolla with cylindraceous tube and narrow throat, strongly bilabiate; upper lip compressed laterally, fornicate or conduplicate; lower erect at base, 2-cristate above, 3-lobed; the lobes spreading or reflexed, the middle one smaller. Capsule compressed and often oblique or falcate, rostrate. Leaves mainly alternate or verticillate.

16. **Rhinanthus.** Calyx ventricose-compressed, 4-toothed, inflated in fruit. Corolla with cylindraceous tube; galeate upper lip ovate, obtuse, compressed, entire at apex, but with a minute tooth on each side below it; lower lip shorter, with 3 spreading lobes. Capsule orbicular, compressed. Leaves opposite.

1. LINARIA, Tourn. Toad-Flax.

Herbs: calyx 5-parted: leaves entire and mostly linear: flowers in a naked terminal raceme.

1. **L. Canadensis,** Dumont. Flowering stems nearly simple, 6 to 30 inches high: leaves flat, alternate on the erect flowering stems, smaller and oblong and mainly opposite or whorled or procumbent shoots or suckers from the base: pedicels erect, not longer than the filiform and curved spur of the small blue corolla. — Across the continent, in sandy soil.

2. COLLINSIA, Nutt.

Low; with simple opposite sessile leaves, or the upper verticillate: flowers solitary or umbelliform-verticillate: corolla often 2-colored.

1. **C. parviflora,** Dougl. About a span high, at length diffuse or spreading: leaves oblong or lanceolate; the upper narrowed at base and entire; the floral often in whorls of 3 to 5: pedicels solitary or above 2 to 5 in the whorl: calyx-lobes lanceolate or triangular-subulate, usually almost equalling the blue (or partly white) corolla: gland small, capitate, short-stipitate. — From Arizona and Utah to Washington Territory and Michigan.

3. SCROPHULARIA, Tourn. Figwort.

Usually tall and homely herbs; with opposite leaves and loose cymes of small flowers in a narrow terminal thyrsus.

1. **S. nodosa,** L. Nearly glabrous, 2 or 3 feet high: thyrsus elongated and open: leaves ovate or oblong-ovate, acute, with a rounded or subcordate base, sharply and often doubly serrate: rudiment of fifth stamen orbicular.

Var. **Marilandica,** Gray. Taller, sometimes 5 feet high: leaves larger and thinner, acuminate, often ovate-lanceolate, seldom at all cordate, mostly simply serrate. — Synopt. Fl. ii. 258. From Oregon and Utah eastward across the continent.

4. PENTSTEMON, Mitchell. Beard-tongue.

Usually with simple stems or branched from the base: the leaves opposite, rarely verticillate: inflorescence from thyrsiform to almost simply racemose, and the flowers mostly showy.

§ 1. *Anther-cells soon divaricate or divergent, united and often confluent at the apex, dehiscent for their whole length or nearly.*

* *Anthers densely comose with very long wool, peltately explanate in age: low and suffruticose, with coriaceous leaves.*

1. **P. Menziesii,** Hook. From a few inches to a foot high: leaves commonly ovate, obovate, or oblong, ¼ to 1 inch long, rigidly serrulate or some entire, glabrous or when young pubescent: inflorescence mostly glandular or viscid-pubescent, racemose: pedicels almost all 1-flowered: corolla violet-blue to pink-purple, an inch or more long, tubular-funnelform and moderately bilabiate: sterile filament short and slender, hairy at apex or nearly naked. — On rocks and in the mountains, from Wyoming to California and northward.

* * *Anthers glabrous (rarely villous); the cells dehiscent from the base towards but not to the apex: corolla tubular, red: sterile filament mostly glabrous: herbs glabrous and usually glaucescent: leaves all entire; the cauline sessile or partly clasping: thyrsus elongated, loosely-flowered.*

2. **P. barbatus,** Nutt. Usually tall, 2 to 6 feet high: leaves lanceolate or the upper linear-lanceolate; the lowest oblong or ovate: sepals ovate: *corolla strongly bilabiate,* an inch long, from light pink-red to carmine; *base of the lower lip or throat usually bearded with long and loose or sparse yellowish hairs.* — Mountains of Colorado and New Mexico.

Var. **Torreyi,** Gray. A tall and usually deep scarlet-red-flowered form, with few or no hairs in the throat. — Bot. Mex. Bound. 114. From Colorado and New Mexico to W. Texas.

Var. **trichander,** Gray, is like a low form of var. *Torreyi,* except that the anthers are beset with long woolly hairs. — Proc. Am. Acad. xi. 94. S. W. Colorado, *Brandegee.*

3. **P. Eatoni,** Gray. A foot or two high: leaves from lanceolate to ovate; the upper partly clasping: *peduncles very short,* 1 to 3-flowered: *corolla obscurely bilabiate,* an inch long, bright carmine-red; *its lobes all nearly alike.* — Proc. Am. Acad. viii. 395. From the Wahsatch Mountains, Utah, to Nevada and Arizona.

* * * *Anthers with the diverging or divaricate and distinct cells dehiscent from base nearly or quite to the apex, but not confluent, not peltately explanate after dehiscence, either glabrous, hirsute, or pilose: herbs with simple stems and closely sessile glabrous entire cauline leaves: inflorescence never glandular-pubescent or viscid: flowers showy: corolla blue or violet.*

4. **P. Fremonti,** Torr. & Gray. A span or more high, *minutely and densely pruinose-pubescent:* cauline leaves lanceolate or the lowest and radical spatulate: *thyrsus* spiciform, virgate, *rather densely flowered: sepals oblong-ovate, acute,* with irregular scarious margins: corolla very obscurely bilabiate, funnelform, ⅜ *to* ¾ *inch long, with throat but little dilated:* anthers hirsute: sterile filament with dilated bearded apex. — Proc. Am. Acad. vi. 60. "On the Uinta plains," Utah, *Fremont.*

Var. **subglaber,** Gray. Merely puberulent below, *glabrous above:* upper leaves oblong-lanceolate: *sepals conspicuously acuminate.* — Synopt. Fl. ii. 262. In the mountains near Fort Hall, Idaho, etc.

5. **P. strictus,** Benth. *Glabrous,* or minutely pruinose, *more or less glaucous:* stem slender, 6 to 20 inches high: radical leaves from oval to spatulate; cauline narrowly lanceolate or linear; floral reduced to small subulate bracts of the elongated narrow and *loose thyrsus: sepals ovate or oval, obtuse: corolla about an inch long; the throat strongly ampliate:* anthers either thickly or sparsely comose with very long flexuous hairs: sterile filament naked or with some similar slender hairs. — Mountains of W. Wyoming to S. W. Utah.

6. **P. glaber,** Pursh. *Glaucous or glaucescent and very glabrous:* stems a foot or two high: leaves mostly oblong-lanceolate or the upper ovate-lanceolate: *thyrsus elongated and many-flowered: sepals from orbicular-ovate and merely acute to ovate-lanceolate or strongly acuminate* from a broadish base: *corolla* 1 *to* 1½ *inches long, the throat ampliate:* anthers from glabrous to sparsely hirsute. — From Nebraska and Dakota to Colorado, Arizona, and west to Oregon and California.

Var. **alpinus,** Gray. A span high: cauline leaves from narrowly to broadly lanceolate: thyrsus shortened and few-flowered. — Alpine regions from the Yellowstone to Pike's Peak.

Var. **cyananthus,** Gray. Usually tall: leaves all broad; the cauline ovate or subcordate and ovate-lanceolate: thyrsus dense: sepals much acuminate or narrow: anthers and sterile filament from hirsute to nearly glabrous. — Proc. Am. Acad. vi. 60. *P. cyananthus,* Hook. Wyoming and Colorado to the Wahsatch in Utah.

* * * * *Anthers dehiscent from base to apex and confluent, glabrous, explanate after dehiscence: herbs or rarely suffrutescent at base.*

+ *Glabrous throughout even to pedicels and calyx: leaves all entire, from linear to ovate, glaucous or pale: stems simple and erect: thyrsus virgate or contracted: corolla less than an inch long.*

++ *Corolla abruptly campanulate-inflated, rather strongly bilabiate.*

7. **P. secundiflorus,** Benth. *A foot or two high,* including the elongated and racemiform strict *many-flowered thyrsus:* cauline leaves narrowly lanceolate; radical spatulate: peduncles 1 to 3-flowered: sepals ovate or oblong, with somewhat scarious but *entire margins: corolla with narrow proper tube nearly twice the length of the calyx:* sterile filament glabrous or minutely bearded at the dilated tip. — Mountains of Colorado.

8. **P. Hallii,** Gray. Resembling the last, but *lower:* leaves thickish, linear and linear-spatulate: thyrsus short and more spiciform, 5 *to* 15-*flowered,* obscurely viscid: sepals broadly ovate and with widely scarious *erose margins: corolla with thickish and inconspicuous proper tube shorter than the calyx:* sterile filament short bearded from apex downward. — Proc. Am. Acad. vi. 71. Mountains of Colorado, at 10,000 to 12,000 feet.

++ ++ *Tube of corolla gradually and moderately dilated into the funnelform throat; lobes obscurely bilabiate.*

9. **P. acuminatus,** Dougl. Glaucous, 6 to 20 inches high, generally stout and rigid, leafy: *leaves coriaceous; radical and lowest cauline obovate or oblong; upper cauline from lanceolate to broadly ovate, or the upper cordate-clasping,* these mostly acute or acuminate: thyrsus strict, interrupted, leafy below, naked above: *sepals ovate and acute* or lanceolate: corolla lilac or changing

to violet: sterile filament mostly bearded at the dilated tip. — From the Saskatchewan and Upper Missouri to Oregon, New Mexico, and W. Texas.

10. **P. cæruleus,** Nutt. Like the last, but *low: leaves all from lanceolate to narrowly linear:* thyrsus spiciform and usually dense: *sepals lanceolate-acuminate:* corolla blue, varying occasionally to rose-lilac or white: sterile filament much bearded above. — Plains of Dakota and Montana to Colorado.

+ + *Puberulent or pubescent and above viscid or glandular: leaves from oblong to lanceolate-linear, entire or the margins undulate: thyrsus racemiform: corolla ample, purplish; its tube little if any longer than the sepals, abruptly dilated into the campanulate or broadly funnelform throat.*

11. **P. Jamesii,** Benth. *Pruinose-puberulent:* leaves all narrowly or linear-lanceolate: *corolla abruptly dilated into a broadly cyathiform-campanulate throat,* a little hairy within: *sterile filament moderately bearded.* — Prairies, S. Colorado to New Mexico and W. Texas.

12. **P. cristatus,** Nutt. *Pubescent, or above viscid-villous:* leaves from linear-lanceolate to narrowly oblong: *corolla more funnelform,* being less abruptly dilated; its lower lip long-villous within: sterile filament more exserted, *inordinately yellow-bearded.* — From Dakota to Nevada and S. Colorado.

+ + + *Puberulent or viscid-pubescent, at least the inflorescence, or sometimes glabrous: leaves various: corolla from 4 lines to an inch long, not abruptly campanulate-ventricose above: sepals usually narrow or acuminate.*

++ *Leaves from ovate to lanceolate, undivided: stems erect or ascending: thyrsus mostly many-flowered.*

= *Corolla hardly at all bilabiate, funnelform, with widely spreading lobes, whitish or tinged with purple.*

13. **P. albidus,** Nutt. *Viscid-pubescent,* 6 to 10 inches high: *leaves* oblong-lanceolate or narrow, *entire* or sparingly denticulate: *thyrsus* strict, leafy below, *of approximate few to several-flowered clusters: sepals densely viscid-pubescent,* 3 or 4 lines long: corolla with shorter tube, the rather ample limb about as broad. — On the plains from Dakota to Colorado and Texas.

14. **P. deustus,** Dougl. *Completely glabrous,* or the calyx obscurely glandular, a span to a foot high in tufts from a woody base, rigid: *leaves coriaceous,* from ovate to oblong-linear or lanceolate, *irregularly and rigidly dentate or acutely serrate,* or some of them entire: *thyrsus virgate or more paniculate,* mostly many-flowered: corolla narrowly or broadly funnelform, half-inch or less long. — In the interior from California to British Columbia and eastward into Montana.

= = *Corolla more plainly bilabiate; lower lip usually somewhat bearded or pubescent within.*

15. **P. confertus,** Dougl., var. **cæruleo-purpureus,** Gray. Glabrous throughout, or the inflorescence and calyx viscid-pubescent or puberulent, from 2 inches to 2 feet high: leaves from oblong or oblong-lanceolate to somewhat linear, usually entire: *thyrsus spiciform, interrupted,* naked, *of 2 to 5 dense verticillate flower clusters,* or in the low mountain forms with capituliform inflorescence: pedicels very short: sepals variable, usually broad, *commonly very scarious and erose,* sometimes with a long herbaceous acumination: corolla narrow, 4 to 6 lines long, blue-purple and violet; *lower lip conspicu-*

ously bearded within. — Mountains of Colorado and northward, thence westward to Oregon and through the Sierra Nevada.

16. **P. Watsoni,** Gray. Glaucescent and glabrous throughout, or inflorescence and calyx puberulent, but not viscid, a foot or more high: cauline leaves oblong-lanceolate to ovate-lanceolate, acute or acuminate, entire or denticulate: *contracted thyrsus rather loose:* pedicels longer than the calyx: *sepals broadly ovate or orbicular,* somewhat scarious-margined: corolla narrowly funnelform, 6 to 8 lines long, violet-purple or partly white; *lower lip almost glabrous within.* — Synopt. Fl. ii. 267. *P. Fremonti,* var. *Parryi,* Gray. Mountains of W. Colorado, Utah, Nevada, and Arizona.

17. **P. humilis,** Nutt. Glabrous or *viscid-pubescent above,* a span or two high: leaves glaucescent, from oblong to lanceolate; *the cauline commonly denticulate: thyrsus strict and virgate,* 2 to 4 inches long: pedicels short: *sepals ovate or lanceolate and acuminate:* corolla narrowly funnelform, half-inch long, deep-blue or partly white; *lower lip somewhat hairy within.* — In the mountains from S. Colorado to the British boundary and westward.

Var. **brevifolius,** Gray. A low and diffuse tufted form, with weak stems: leaves at most half-inch long; cauline elliptical-oblong; the radical oval or rotund: corolla light blue. — Synopt. Fl. ii. 267. In the Wahsatch Mountains of Utah at 9,000 or 10,000 feet elevation.

18. **P. gracilis,** Nutt. A foot or less high, glabrous or merely puberulent up to the *more or less viscid-pubescent strict thyrsus:* stems slender: *cauline leaves mostly linear-lanceolate,* sometimes denticulate; *the radical spatulate or oblong:* cymes of the thyrsus pedunculate: *sepals lanceolate,* acute, *margineless: corolla tubular-funnelform or almost cylindraceous,* lilac-purple or sometimes whitish, ¾ to 1 inch long; the throat open. — *P. pubescens,* var. *gracilis,* Gray. From Colorado to Wyoming and the Saskatchewan.

19. **P. glaucus,** Graham. Glabrous up to the inflorescence, more or less glaucous: stems dwarf or ascending, a span to a foot high: *leaves thickish, oblong-lanceolate* or the radical oblong-ovate, entire or denticulate: *thyrsus short and compact, either simple or compound, villous-pubescent and viscid or glandular:* corolla dull lilac or violet-purple, less than an inch long, *swollen above the short tube, gibbous;* the throat widely open; the broad lower lip sparsely villous-bearded within. — Mountains of Wyoming, Utah, and far northward.

Var. **stenosepalus,** Gray. Sometimes over a foot high: thyrsus comparatively small and glomerate: sepals attenuate-lanceolate: corolla dull whitish or purplish. — Mountains of Colorado and Utah.

++ ++ *Leaves from linear-spatulate to obovate, entire: stems low-cespitose spreading, leafy to the summit, few-flowered.*

= *Leaves green and mostly glabrous, ¼ to ½ inch wide.*

20. **P. Harbourii,** Gray. Tufted nearly simple stems 2 to 4 inches high, puberulent: leaves about 3 pairs, thickish, obovate, oval, or the uppermost ovate, these sessile by a broad base: thyrsus reduced to 2 or 3 crowded short-pedicelled flowers: sepals villous and somewhat viscid: corolla little bilabiate, with rather broad cylindraceous throat and tube; lower lip bearded within. — Proc. Am. Acad. vi. 71. High alpine region of the Colorado Mountains.

= = *Leaves cinereous or canescent,* 1 *or* 2 *lines wide: flowering along the short stems in the axils of the leaves: short peduncles* 1 *to* 3*-flowered.*

21. **P. pumilus,** Nutt. *Canescent with a dense and fine short pubescence:* stems an inch or two high, *erect or ascending,* very leafy: leaves lanceolate or the lower spatulate: corolla with regularly funnelform throat, *glabrous within: sterile filament sparsely short-bearded,* or more abundantly at the tip. — Mountains of Montana, *Wyeth.*

22. **P. cæspitosus,** Nutt. *Minutely cinereous-puberulent,* spreading, *forming depressed broad tufts* 2 to 4 inches high: leaves from narrowly spatulate to almost linear: peduncles mostly secund and horizontal, but with the flower upturned: corolla tubular-funnelform, and the *lower side biplicate, the narrow folds sparsely villous within: sterile filament strongly and densely bearded.* — Mountains of Wyoming, Colorado, and Utah.

++ ++ ++ *Leaves from narrowly linear-lanceolate with tapering base or linear-spatulate to filiform, entire: stems or branches racemosly several to many-flowered.*

23. **P. laricifolius,** Hook. & Arn. Glabrous: *stems or tufted branches simple* from an underground woody base: leaves very slender, when dry filiform, *much crowded in subradical tufts* and scattered on the filiform flowering stems: *short peduncles alternate:* flowers few, loosely racemose: corolla tubular-funnelform, half-inch long; *the small limb obscurely bilabiate: sterile filament longitudinally bearded.* — Wyoming and Oregon.

24. **P. ambiguus,** Torr. Glabrous, a foot or two high, *diffuse and often much branched:* leaves filiform, or the lowest linear and the floral slender-subulate: inflorescence loosely paniculate: *peduncles slender, opposite,* the upper one-flowered: corolla rose-color and flesh-color becoming white; *the rotately expanded limb oblique* but obscurely bilabiate; lobes orbicular-oval; throat somewhat hairy: *sterile filament glabrous,* sometimes imperfectly antheriferous. — Plains of E. Colorado and New Mexico to S. Utah and Arizona.

§ 2. *Anthers sagittate or horseshoe-shaped; the cells confluent at the apex, and there dehiscent by a continuous cleft, which extends down both cells only to the middle: the base remaining closed and saccate. In ours the sterile filament is glabrous.*

* *Corolla blue to purple, ventricose-funnelform, short-bilabiate,* ⅔ *to* 1½ *inches long: inflorescence, calyx, etc. glabrous.*

25. **P. Kingii,** Watson. Hardly glaucous: *stems a span or so high from the depressed woody base,* leafy to the top, erect or ascending: leaves oblanceolate or lanceolate-linear, mostly narrowed to the base: *thyrsus strict,* 1 to 5 inches long: *corolla* ⅔ *inch long, purple.* — Synopt. Fl. ii. 272. Uinta and Wahsatch Mountains and westward.

26. **P. azureus,** Benth. Glaucous, rarely pruinose-puberulent: stems erect or ascending, 1 *to* 3 *feet high:* leaves from narrowly to ovate-lanceolate or even broader: *thyrsus virgate, loose,* usually elongated: *corolla from* 1 *to* 1½ *inches long, azure-blue to violet,* the base sometimes reddish; *the expanded limb sometimes an inch in diameter.*

Var. **Jaffrayanus,** Gray. A low form: leaves oblong or oval, or the upper ovate-lanceolate or ovate, very glaucous: peduncles 1 to 5-flowered:

flowers large. — Bot. Calif. ii. 567. From the Wahsatch Mountains westward to California.

Var. **ambiguus,** Gray. A rather tall form, paniculately branched and slender, with lanceolate and linear leaves all narrowed at base, pale and glaucescent, and the corolla violet-blue, an inch or less long: sepals remarkably small. — Synopt. Fl. ii. 272. *P. heterophyllus,* Watson. Cañons of the Wahsatch Mountains and westward.

* * *Corolla scarlet-red, tubular-funnelform, conspicuously bilabiate, an inch long.*

27. **P. Bridgesii,** Gray. A foot or two high from a woody base, glabrous up to the virgate secund thyrsus, or puberulent: leaves from spatulate-lanceolate to linear; the floral reduced to small subulate bracts: peduncles, pedicels, and sepals glandular-viscid: lips of the narrow corolla fully a third the length of the tube; the upper erect and 2-lobed; the lower 3-parted and its lobes recurved. — Proc. Am. Acad. vii. 379. S. W. Colorado, *Brandegee,* and westward into S. California.

5. CHIONOPHILA, Benth.

A high alpine dwarf perennial, with entire leaves mostly in a radical tuft and a dense spike of cream-colored flowers.

1. **C. Jamesii,** Benth. Glabrous or nearly so: leaves thickish, spatulate or lanceolate, tapering into a scarious sheathing base; those on the scape-like flowering stems one or two pairs, or occasionally alternate, linear: spike few to many-flowered, mostly secund, bracteate: corolla over a half-inch long, dull cream-color. — Gray in Am. Jour. Sci. II. xxxiii. 254. Alpine regions of the Colorado mountains.

6. MIMULUS, L. Monkey-flower.

Flowers usually showy and axillary, or becoming racemose by the reduction of the upper leaves to bracts.

* *Viscid or glandular-pubescent.*

+– *Leaves sessile or nearly so, entire or few-toothed: corolla rose-purple or yellow.*

1. **M. nanus,** Hook. & Arn. From an inch to a span or more high: *leaves from obovate or oblong to lanceolate: calyx-teeth broadly lanceolate or triangular,* a quarter of the length of the tube: corolla ½ to ¾ inch long, funnelform, with widely spreading limb and throat gradually narrowed downward into the included or partly exserted tube: *stigma peltate-funnelform:* capsules with tapering apex rather exceeding the calyx. — Ranging chiefly west of our limit, but extending eastward into Wyoming.

2. **M. rubellus,** Gray. From 2 to 10 inches high, branched from the base: *leaves from spatulate-oblong to linear,* ½ to ¾ inch long, commonly equalling the pedicels; the lower sometimes obovate or ovate: *calyx-teeth short and obtuse:* corolla 3 or 4 lines long, from a third to twice the length of the calyx, yellow or rose-color, sometimes yellow varying or changing to crimson-purple; the throat broad and open: *stigma bilamellar.* — From New Mexico and Arizona to Colorado and Washington Territory.

+– +– *Leaves petioled, denticulate or serrate: corolla narrow, light yellow.*

3. **M. floribundus,** Dougl. About a span high, *flowering from almost the lowest axils, the lateral branches diffusely spreading:* leaves ovate and the lower subcordate, *an inch long or less;* the upper shorter than the somewhat racemose pedicels: *calyx short-campanulate,* becoming ovate or oblong and truncate in fruit; *the teeth short and triangular:* corolla 3 to 6 lines long: *capsule globose-ovate, obtuse.* — From the mountains of Colorado and Wyoming to California and Oregon.

4 **M. moschatus,** Dougl. *More villous and viscid, musk-scented: stems spreading and creeping,* a foot or so long: leaves oblong-ovate, *an inch or two long,* mostly exceeding the pedicels: *calyx short-prismatic,* becoming oblong-campanulate in fruit; *the teeth broadly lanceolate and acuminate:* corolla usually ⅔ inch long: *capsule ovate, acute.* — From W. Wyoming to California and British Columbia. Known as the "Musk Plant."

* * *Neither viscid nor glandular.*

+– *Corolla rose-red: calyx oblong-prismatic; the short teeth nearly equal.*

5. **M. Lewisii,** Pursh. Slender, 2 to 4 feet high, with minute or fine pubescence: leaves from oblong-ovate to lanceolate, denticulate: corolla 1½ to 2 inches long; the roundish lobes all spreading: stamens included. — Throughout the Sierra Nevada and extending eastward into Montana and Utah.

+– +– *Corolla yellow: calyx campanulate, oblique at the orifice; the posterior tooth largest.*

6. **M. Jamesii,** Torr. & Gray. Diffuse and creeping, glabrate: *leaves roundish and often reniform,* from denticulate to nearly entire, 4 to 12 lines long, *all but the uppermost with margined petioles: flowers all axillary* and slender-pedicelled: *corolla light yellow,* 4 to 6 lines long: fructiferous calyx campanulate, 3 lines long: *seeds shining, almost smooth.* — In water or wet places, in the mountains from Arizona to Montana and eastward to Illinois and Michigan.

7. **M. luteus,** L. Glabrous or puberulent: stems erect; the larger forms 2 to 4 feet high: *leaves ovate, oval-oblong, roundish, or subcordate;* the upper cauline and floral smaller, *closely sessile, not rarely connate-clasping;* all usually acutely dentate or denticulate; lower sometimes lyrately laciniate: *inflorescence chiefly racemose or terminal: corolla deep yellow, commonly dark-dotted within,* and the protuberant base of lower lip blotched with brown-purple or copper-color, sometimes 1 to 2 inches long: calyx ventricose-campanulate, a half-inch or less long: *seeds rather dull, longitudinally striate-reticulate.* — Throughout the Rocky Mountains and westward. Immensely variable.

Var. **alpinus,** Gray. A span or so high: stem 1 to 4-flowered: some leaves rather distinctly pinnate-veined above the middle. — Proc. Acad. Philad. 1863, 71. From the Colorado mountains and California Sierras to Alaska.

Var. **depauperatus,** Gray. Includes reduced or depauperate forms, 2 to 10 inches high, with leaves 3 to 6 lines long, fruiting calyx 2 or 3 lines long, and corolla 3 to 7 lines long. — Bot. Calif. i. 567. Rocky Mountains and westward.

7. GRATIOLA, L. Hedge Hyssop.

Soft-herbaceous and diffusely branching plants, from a creeping base, growing in wet soil: pedicels solitary and axillary, with a pair of foliaceous bractlets close to the calyx and equalling it.

1. **G. Virginiana,** L. Viscid-puberulent or more pubescent, or below nearly glabrous, divergently branched from the base, a span or less high: leaves commonly glabrous, oblong-lanceolate, acute, from entire to denticulate-serrate, mostly narrow at base: corolla 4 or 5 lines long, with yellowish tube barely twice the length of the calyx; lobes nearly white, the two upper emarginate. — Across the continent.

8. LIMOSELLA, L. Mudwort.

Small, glabrous plants, with fibrous roots and a cluster of entire fleshy leaves at the nodes of the stolons, and short scape-like naked pedicels from the axils, bearing a small and white or purplish flower.

1. **L. aquatica,** L. Tufts an inch or two high: clustered leaves longer than the pedicels, when scattered on sterile shoots alternate, in the typical form with a spatulate or oblong blade on a distinct petiole; this in mud rather short, in water elongating to the length of 2 to 5 inches. — From Hudson's Bay to S. Colorado, and westward to the Sierras.

9. SYNTHYRIS, Benth.

Leaves largely radical and petioled; those of the simple stem or scape and the bracts alternate: flowers small, purplish or flesh-color, in a simple spike or raceme. In ours the flowers are in a dense spike terminating a stouter leafy scape or stem.

* *Leaves laciniately cleft or divided, all radical: corolla cylindraceous, 4-cleft to the middle.*

1. **S. pinnatifida,** Watson. Tomentulose-pubescent and glabrate: leaves slender-petioled, from round-reniform to oblong in outline, from palmately to pinnately 3 to 7-parted or below divided, and the divisions again laciniately cleft or parted: scape sparingly bracteate, a span high: spike narrow: corolla whitish. — Bot. King Exp. 227. In the Wahsatch Mountains of Utah and probably extending eastward in the mountains.

* * *Leaves undivided, merely crenate or crenulate: scape or stem leafy-bracteate.*

+ *Corolla mostly 2-parted, rarely 3-parted, and stamens inserted on its very base.*

2. **S. alpina,** Gray. *A span or only an inch or two high,* early glabrate except the *very lanuginous inflorescence:* radical leaves oval or subcordate, *an inch or so long* on a longer petiole: *base of scape naked: bracts and lanceolate sepals very long-woolly-villous at margins:* corolla violet-purple; *its broad upper lip twice the length of the calyx,* the 2 to 3-parted lower one small and included. — Am. Jour. Sci. II. xxxiv. 251. In the alpine region of the Colorado Rocky Mountains.

3. **S. plantaginea,** Benth. *A foot or less high, rather stout:* tomentulose-pubescent when young: radical leaves oblong, rarely cordate, usually obtuse at base, 2 *to* 4 *inches long: scape very leafy-bracteate:* spike 3 to 5 inches long: *bracts and ovate sepals glabrate and villous-ciliate:* corolla purplish; *its upper lip little exceeding the calyx,* twice the length of the 2 to 3-lobed lower one. — Mountains of Colorado and New Mexico, in subalpine woods.

+ + *Corolla wanting: stamens inserted on the outside of the hypogynous disk.*

4. **S. rubra,** Benth. A span to a foot or more high, rather stout, more or less pubescent, and the spike tomentose, 2 to 5 inches long: radical leaves ovate or obscurely cordate, 1 to 3 inches long; the cauline similar, but small and sessile: sepals oblong. — From Montana and N. Utah westward into Oregon and Washington Territory.

10. VERONICA, L. Speedwell. Brookline.

Leaves opposite or verticillate or the upper alternate, as are the bracts: flowers small, racemose, spicate, or solitary in the axils, never yellow.

* *Perennials, stoloniferous or creeping at base: racemes in the axils of the opposite leaves.*

+ *Capsules turgid, orbicular: seeds merely compressed: racemes commonly from opposite axils: corolla pale blue, often purple-striped.*

1. **V. Anagallis,** L. Glabrous, or inflorescence glandular-puberulent: *leaves sessile by broadish somewhat clasping base, and tapering gradually to the apex,* oblong-lanceolate, entire or obscurely serrate. — Across the continent, mainly to the northward.

2. **V. Americana,** Schwein. Glabrous: *leaves all or mostly petioled,* ovate or oblong, *truncate-subcordate at base, usually obtuse:* pedicels more slender. — About the same range as the last.

+ + *Capsules strongly compressed contrary to the partition: seeds very flat: racemes from alternate or sometimes from opposite axils: corolla mostly pale blue.*

3. **V. scutellata,** L. Glabrous: stem slender, a span or two high: leaves sessile, linear or linear-lanceolate, acute, remotely denticulate: racemes several, filiform, flexuous: flowers scattered or filiform and widely spreading pedicels: capsule deeply emarginate at apex and slightly at base. — Across the northern part of the continent.

* * *Low perennials, with ascending or erect flowering stems terminated by a single raceme: cauline leaves above passing into bracts.*

4. **V. alpina,** L. A span or rarely a foot high, hirsute-pubescent or glabrate: *leaves sessile, ovate to oblong,* crenulate-serrate or entire, ½ *to* 1 *inch long: raceme spiciform or subcapitate,* dense, or interrupted below: corolla blue or violet: *capsule elliptical-obovate, emarginate.* — Alpine regions of the Rocky Mountains, Sierra Nevada, and White Mountains, and also far northward.

5. **V. serpyllifolia,** L. Glabrous or puberulent: stems creeping or branching at base, with flowering summit ascending 3 to 9 inches high: *leaves oval or roundish,* entire or crenulate, *half-inch or less long; the lower short-petioled;* the upper sessile and passing into bracts of the *leafy spiciform raceme:* corolla

usually bluish or pale with blue stripes: *capsule oblately orbicular and obcordate.* — Throughout the continent.

* * * *Low annuals: flowers in the axils of ordinary or bract-like commonly alternate leaves, very short-pedicelled.*

6. **V. peregrina,** L. Glabrous, or above minutely pubescent or glandular: stem and branches erect, a span or two high: leaves thickish; lowest petioled and oblong or oval, dentate; the others sessile, from oblong to linear-spatulate; uppermost more bractlike and entire: capsule orbicular and slightly obcordate. — Throughout the continent. "Neckweed."

11. GERARDIA, L.

Erect and branching herbs; with mainly opposite leaves, the uppermost reduced to bracts of the racemose or paniculate showy flowers. Our species belong to the section with purple or rose-colored flowers and linear or filiform cauline leaves, the herbage blackening in drying.

1. **G. aspera,** Dougl. *Stems and branches strict:* leaves rather erect, *strongly hispidulous-scabrous, all filiform-linear: pedicels mostly equalling and sometimes moderately exceeding the calyx, erect: calyx-lobes deltoid-subulate or triangular-lanceolate from a broad base, about half the length of the tube: anthers obscurely if at all mucronulate at base.* — On the plains within the eastern limit of our range, and extending eastward to Wisconsin and Illinois.

2. **G. tenuifolia,** Vahl. *Smooth or usually so,* about a foot high, *paniculately much branched,* but the inflorescence racemose: *leaves mostly narrowly linear, equalling the lower but mostly shorter than the uppermost pedicels: calyx-teeth very short:* corolla about a half-inch long: *anthers woolly, and cuspidate-mucronate at base.*

Var. **macrophylla,** Benth. Stouter: larger leaves 1½ to 2 inches long and almost 2 lines wide, scabrous: pedicels ascending: calyx-teeth usually larger: corolla little over a half-inch long. — From Colorado to W. Iowa and W. Louisiana.

12. CASTILLEIA, Mutis. PAINTED-CUP.

Herbs with alternate entire or laciniate leaves, passing above into usually more incised and mostly colored conspicuous bracts of a terminal spike: the flowers solitary in their axils, red, purple, yellowish, or whitish; but the corolla almost always duller-colored than the calyx or bracts.

* *Annuals with virgate stems, mostly tall and slender: leaves and bracts all linear-lanceolate and entire; the latter or at least the upper with red linear tips.*

1. **C. minor,** Gray. A foot or two high, pubescence villous or soft-hirsute: flowers all pedicellate, the lower rather remote in the leafy spike: calyx gibbous and broadest at base, wholly green, about equally cleft before and behind to near the middle: corolla narrow and straight, ½ to ¾ inch long, yellow; galea (upper lip) very much longer than the small lip, much shorter than the tube. — Bot. Calif. i. 573. *C. affinis,* var. *minor,* Gray. In wet ground, from Nebraska to W. Nevada and New Mexico.

* * *Perennials.*

+ *Calyx deeper cleft before than behind, mostly colored red, as are a part of the bracts: corolla large, an inch or two long; its galea about equalling the tube.*

2. **C. linariæfolia,** Benth. Mostly tall and strict, 2 to 5 feet high, glabrous below, the spike somewhat pubescent or villous: leaves linear, entire, or some of the upper sparingly laciniate, and the uppermost and bracts 3-parted: calyx over an inch long, mostly red or crimson, sometimes pale; the anterior fissure very much deeper than the posterior; the long upper lip acutely 4-toothed: corolla 1½ or 2 inches long; its narrow falcate galea much exserted. — In the mountains of Wyoming and Colorado, and southward and westward.

+ + *Calyx about equally cleft before and behind: floral leaves or bracts more or less dilated and petaloid-colored (red or crimson, varying to yellowish or whitish).*

++ *Pubescence never tomentose nor cinereous-tomentulose.*

= *Galea equalling or longer than the tube of the corolla; the lip very short.*

3. **C. parviflora,** Bong. A span to 2 feet high, *villous-hirsute,* at least above: *leaves variously laciniately cleft into linear or lanceolate lobes,* or sometimes the cauline mainly entire and narrow: calyx-lobes oblong and 2-cleft at apex or to below the middle: *corolla an inch or less long; only the upper part of the narrow galea exserted; the small lip not protuberant.* — From Dakota and Colorado westward and northward.

4. **C. miniata,** Dougl. A foot or two high, mostly simple and strict, *glabrous* or nearly so except the inflorescence: leaves lanceolate or linear, or the upper ovate-lanceolate, *entire:* spike dense and short: bracts mostly bright red, rarely whitish, seldom lobed: calyx-lobes lanceolate, acutely 2-cleft: *corolla over an inch long; the galea exserted, linear, longer than the tube; very short lip protuberant and callous.* — *C. pallida,* var. *miniata,* Gray. Extending southward from Alaska and British Columbia along the higher mountains of Colorado, Utah, and California. Exceedingly variable.

= = *Galea decidedly shorter than the tube of the corolla and not over twice or thrice the length of the lip.*

5. **C. pallida,** Kunth. A foot or so high, strict, commonly villous with weak cobwebby hairs, at least the dense and short leafy-bracted spike, or below glabrous: leaves mainly entire; the lower linear; upper lanceolate or ovate-lanceolate: bracts oval or obovate, partly white or yellowish, equalling the corolla: calyx cleft to or below the middle and again more or less 2-cleft: galea 2 to 4 lines long, barely twice the length of the lip, its base not exserted from the calyx.

Var. **septentrionalis,** Gray. A span to 2 feet high, sometimes almost glabrous: bracts greenish-white, varying to yellowish, purple, or red: lip smaller, from half to hardly a third the length of the galea. — Bot. Calif. i. 575. Mountains of Colorado and Utah, also in the White and Green Mountains, and far northward.

Var. **occidentalis,** Gray. Dwarf and narrow-leaved form, 2 to 6 inches high: bracts comparatively broad, mostly incised or cleft, the tips and flowers whitish: lip about half the length of the rather broad galea. — Bot. Calif.

loc. cit. High alpine region of the Colorado mountains, also in the Sierra Nevada.

Var. **Haydeni,** Gray. More slender, 3 to 5 inches high: linear leaves sometimes with one or two slender-subulate lobes: bracts merely ciliate-pubescent, laciniately 3 to 5-cleft into linear lobes, bright crimson: lip not half the length of the galea. — Synopt. Fl. ii. 297. Alpine region of the Sierra Blanca, S. Colorado.

++ ++ *Tomentulose or cinereous-puberulent, or the stem only lanate-tomentose: bracts, etc. conspicuously petaloid: corolla more exserted, an inch long or over; galea shorter than the tube.*

6. **C. integra,** Gray. A span to a foot high: stem rather stout, tomentose: leaves cinereous-tomentulose, linear, 1½ to 3 inches long, 1 to 3 lines wide, entire: bracts of the short spike red or rose-color, entire or sometimes incised: corolla 1¼ inches long; galea rather broad; lip strongly tri-callous, its lobes very short. — Bot. Mex. Bound. 119. In dry ground, from Colorado to Arizona and Texas.

+ + + *Calyx deeper cleft before than behind: corolla either slender or small, with galea much shorter than its tube and lip comparatively long: bracts and calyx if colored at all yellowish: leaves or their divisions narrowly linear, rather rigid.*

++ *Lip of corolla half the length of the short galea, more or less trisacculate and little if at all callous below the narrow lobes: flowers yellowish or greenish white: clefts of the calyx moderately unequal: leaves mostly 3 to 5-cleft and the divisions sometimes again 2 to 3-cleft: bracts similar, not even their tips colored.*

7. **C. sessiliflora,** Pursh. A span or two high, very leafy, *cinereous-pubescent: leaves 2 or more inches long, with slender lobes, rarely entire:* lobes of the tubular calyx slender: *corolla exserted, about 2 inches long: lip with linear-lanceolate lobes very much longer than the obscurely saccate base.* — On the prairies from Wisconsin and Illinois to Dakota, W. Texas, and New Mexico.

8. **C. breviflora,** Gray. Barely a span high, *more pubescent: lower leaves often entire* and upper only 3 to 5-parted, *an inch or so long:* bracts of the dense spike more dilated: lobes of the ovoid-oblong calyx lanceolate: *corolla little exserted, less than an inch long; lip with somewhat callous or saccate keels about the length of the oblong obtuse lobes.* — Am. Jour. Sci. II. xxxiii. 338.

++ ++ *Lip of corolla very short, globular-saccate and callous, and with very short ovate lobes.*

9. **C. flava,** Watson. A foot high, with numerous slender stems, cinereous-puberulent, at least above, and the elongated spike more pubescent: leaves entire or the upper with one or two lobes: bracts 3-cleft and with dilated base; the upper and calyx yellowish: corolla hardly an inch long; narrow galea little shorter than the tube. — Bot. King Exped. 230. Mountains of Wyoming and E. Utah.

13. ORTHOCARPUS, Nutt.

Low herbs, with mainly alternate entire or 3 to 5-parted and laciniate leaves; the upper passing into bracts of the dense spike and not rarely colored, as also

the calyx-lobes: the corolla yellow, or white with purple or rose-color, often much surpassing the calyx.

* *Corolla with lip rather obscurely saccate, and with conspicuous mostly erect lobes; the galea broadish, obtuse.*

1. **O. pallescens,** Gray. Cinereous-puberulent, not hairy: leaves 3 to 5-parted into linear lobes, or the lower entire: bracts similar with dilated base, or the upper with shorter obscurely whitish or yellowish lobes: calyx deeply 2 cleft, with broad lobes merely 2-cleft at apex: corolla yellowish, over a half-inch long. — Am. Jour. Sci. II. xxxiv. 339. From the mountains of N. W. Wyoming to E. Oregon.

* * *Corolla with simply saccate lip inconspicuously or obsoletely 3-toothed, and moderately smaller ovate-triangular galea; its small tip or mucro usually somewhat inflexed or uncinate.*

+– *Bracts strikingly different from the leaves, much dilated, entire or the lower 3 to 5-lobed, the summit of the middle lobe purple: corolla yellow.*

2. **O. linearifolius,** Benth. Strict, branching at summit, sparsely hirsute or hispid, especially the margins of the 3 to 5-lobed bracts: calyx half the length of the corolla, its lobes with a pair of elongated subulate teeth: corolla ⅔ inch long, narrow; galea with small uncinate tip a little surpassing the lip. —*O. tenuifolius* of the Synopt. Fl., in part. From the mountains of Montana to Oregon.

+– +– *Bracts herbaceous, not colored, less or little different from the leaves, all 3- (rarely 5-) cleft.*

3. **O. luteus,** Nutt. *Pubescent and hirsute, sometimes viscid: stem strict,* a span to a foot high: leaves from linear to lanceolate, occasionally 3-cleft, about equalling the flowers: corolla golden yellow, less than a half-inch long, 2 *or* 3 *times the length of the calyx; tip of galea obtuse and straight.* — Plains, from N. Minnesota to Colorado and westward.

4. **O. Tolmiei,** Hook. & Arn. *Puberulent,* a span or two high, *loosely branched:* leaves narrowly lanceolate-linear, chiefly entire: bracts of the small and short spikes little dilated, often 3-cleft, the upper shorter than the flowers: corolla bright yellow, half-inch long, 3 *or* 4 *times longer than the calyx; minute tip of galea inflexed.* — In the Wahsatch Mountains of Utah and northward.

14. CORDYLANTHUS, Nutt.

Branching annuals, with alternate and narrow leaves, either entire or 3 to 5-parted, and mostly dull-colored flowers in small terminal heads or clusters, or more scattered along the branches: the bracts and calyx not colored.

* *Calyx diphyllous: corolla 2-lipped at summit: flowers short-peduncled or subsessile.*

1. **C. ramosus,** Nutt. A span or two high, diffusely much branched, cinereous-puberulent: leaves filiform, all but the lower usually 3 to 7-parted: flowers few in the small terminal heads or upper axils: corolla dull yellow, barely a half-inch long. — Dry regions from Wyoming to W. Nevada and Oregon.

* *Calyx monophyllous; the anterior division wanting: flowers strictly sessile in the axil of a clasping bract or leaf.*

2. **C. Kingii,** Watson. A foot or less high, diffusely branched, viscid-pubescent or villous: leaves 1 or 2 inches long, mostly 3 to 5-parted into linear-filiform divisions: flowers loosely glomerate or somewhat scattered at the summit of the slender branchlets: corolla less than an inch long, purplish. — Bot. King Exped. 233. S. W. Colorado to Utah and Nevada.

15. PEDICULARIS, Tourn. Lousewort.

Leaves commonly pinnately cleft or dissected, mainly alternate: flowers in a terminal bracteate spike, rarely in a raceme or scattered.

* *Galea produced into a filiform porrect or soon upturned beak; throat with a tooth on each side; tube of corolla nearly included in the 5-toothed calyx: leaves lanceolate in outline, pinnately parted; the divisions acutely serrate or pinnatifid: spike dense and many-flowered, naked: corolla dull rose-red or crimson-purple.*

1. **P. Grœnlandica,** Retz. Glabrous: spike 1 to 6 inches long: calyx-teeth short: beak of the galea half-inch or more long, twice the length of the rest of the corolla, decurved on the accumbent lower lip. — Wet ground, from New Mexico to British Columbia and Hudson's Bay.

* * *Galea of the short white corolla produced into a slender elongated-subulate circinate-incurved beak, nearly reaching the apex of the broad lower lip: calyx cleft in front: whole plant glabrous.*

2. **P. racemosa,** Dougl. A foot or so high, simple or sometimes branching, leafy to the top: leaves lanceolate, undivided, minutely and doubly crenulate, 2 to 4 inches long: flowers short-pedicelled, in a short leafy raceme or spike, or the lower in remote axils and uppermost with bracts hardly surpassing the 2-toothed calyx: slender beak of the galea hamate-deflexed. — From Colorado and Utah to California and British Columbia.

* * * *Galea falcate, and with a conical or thick-subulate beak, edentulate: leaves simply pinnatifid: flowers half-inch long.*

3. **P. Parryi,** Gray. Glabrous, or the inflorescence slightly pubescent: stem a span or two high, very leafy at base: leaves linear-lanceolate in outline, deeply pinnately parted; the divisions linear-lanceolate, closely callous-serrate; uppermost reduced to linear bracts: spike dense, 1½ to 4 inches long: corolla ochroleucous or more yellow; galea strongly falcate, with decurved beak, of about the length of the width of the galea. — Am. Jour. Sci. II. xxxiii. 250. In the mountains from Colorado and Utah to Wyoming and Montana.

* * * * *Galea falcate, arcuate, or with the apex more or less incurved, or anteriorly curvilinear; the beak very short and thick or commonly none: stems simple, leafy.*

– *Not alpine: leaves pinnatifid: spike short and dense: cucullate summit of the galea incurved.*

4. **P. Canadensis,** L. Hirsute-pubescent and glabrate, a span to a foot high: leaves oblong-lanceolate, rather deeply pinnatifid; lobes short-oblong, obtuse, incisely and the larger doubly dentate: spike leafy bracteate: corolla

ochroleucous or tinged or variegated with purple, less than an inch long: tip of galea emarginate-truncate and below conspicuously cuspidate-bidentate. — From the Colorado mountains to Canada and Florida.

+– +– Not alpine, tall or slender.

+– Leaves undivided: galea bidentulate at tip.

5. **P. crenulata,** Benth. Villous-pubescent, at length glabrate: stems a foot or less high: leaves oblong-linear or narrower, obtuse, 1½ to 3 inches long, closely crenate and the broad crenatures minutely crenulate: spike short and dense: corolla whitish or purplish, ¾ inch long, like that of the last, but the teeth at the apex of galea less conspicuous. — In the Colorado Mountains.

+– +– Leaves all pinnately parted and the lower divided, ample; divisions laciniate-serrate or pinnatifid: spike naked: galea almost straight, cucullate at summit.

6. **P. bracteosa,** Benth. *Glabrous,* or the dense cylindraceous and usually pedunculate spike somewhat pilose: stem 1 to 3 feet high: *bracts ovate, acuminate, shorter than the flowers: calyx-lobes equalling the tube: corolla less than an inch long, pale yellow; galea much longer and larger than the lip.* — From the mountains of Colorado and Utah to British Columbia.

7. **P. procera,** Gray. *Puberulent: stem robust,* 1½ to 4 feet high: leaves pinnately divided into lanceolate and irregularly pinnatifid segments: *bracts lanceolate, caudate-acuminate, mostly longer than the flowers,* serrate or denticulate, or the upper entire: spike 8 to 15 inches long: *calyx-lobes much shorter than the tube: corolla about 1½ inches long, sordid yellowish and greenish-striate; galea hardly longer than the ample lip.* — Am. Jour. Sci. II. xxxiv. 251. Mountains of Colorado and New Mexico.

+– +– +– Alpine: stem few-leaved, a span or so high.

8. **P. scopulorum,** Gray. Glabrous, except the arachnoid-lanate dense oblong spike: calyx-teeth triangular subulate, entire, very much shorter than the tube: galea of the reddish-purple (¾ inch long) corolla with its somewhat produced apex obliquely truncate, edentulate or produced on each side into an obscure triangular tooth. — Synopt. Fl. ii. 308. *P. Sudetica,* var. Colorado Rocky Mountains, at 12,000 to 14,000 feet.

16. RHINANTHUS, L. Yellow-Rattle.

Herbs, with erect stem, opposite leaves, and mostly yellow subsessile flowers in the axils, the upper ones crowded and secund in a leafy-bracted spike. Seeds when ripe rattle in the inflated dry calyx.

1. **R. Crista-galli,** L. About a foot high, glabrous, or slightly pubescent above: leaves from narrowly oblong to lanceolate, coarsely serrate; bracts more incised and the acuminate teeth setaceous-tipped: corolla barely half-inch long, only the tip exserted; transverse appendages of the galea transversely ovate, as broad or broader than long: seeds conspicuously winged. — Alpine region of the Rocky Mountains southward to New Mexico and far northward.

Order 57. **OROBANCHACEÆ.** (Broom-Rape Family.)

Root-parasitic herbs, destitute of green foliage, with alternate scales in place of leaves. Flowers hermaphrodite, 5-merous as to perianth, with didynamous stamens, solitary in the axils of bracts or scales, sometimes on scapiform peduncles, sometimes collected in a terminal spike.

1. **APHYLLON,** Mitchell. Cancer-root.

Flowers pedunculate or pedicellate: calyx 5-cleft: corolla somewhat bilabiate; upper lip more or less spreading, mostly 2-lobed; lower spreading: stamens included: style deciduous. — Brownish or whitish, low, commonly viscid-pubescent or glandular plants; with violet-purplish or yellowish flowers.

* *Peduncles or scapes long and slender from the axils of fleshy loose scales, not bracteolate: corolla with elongated somewhat curved tube, and widely spreading somewhat equally 5-lobed limb, only obscurely bilabiate.*

1. **A. uniflorum,** Gray. Scaly stem short and nearly subterranean, bearing few scapes a span high: *calyx-lobes mostly much longer than the tube, subulate,* usually attenuate: *corolla violet-tinged,* the flower an inch long; *the lobes obovate and rather large.* — Damp woods; from Newfoundland to Texas, and westward across the continent.

2. **A. fasciculatum,** Gray. More pubescent and glandular: stem often emergent and mostly as long as the numerous *fascicled peduncles,* not rarely shorter: *calyx-lobes broadly or triangular-subulate, not longer than the tube,* very much shorter than the *dull yellow or purplish corolla; lobes of the latter oblong and smaller.* — From Lake Michigan to Arizona and westward across the continent; on *Artemisia, Eriogonum,* etc.

Var. **luteum,** Gray. A very caulescent and short-peduncled form, with sulphur-yellow corolla, and whole plant light yellow. — Synopt. Fl. ii. 312. Wyoming, *Parry.* On grasses.

* * *Caulescent, and the inflorescence thyrsoid or spicate: pedicels or calyx* 1 *to* 2-*bracteolate: corolla manifestly bilabiate.*

3. **A. multiflorum,** Gray. Whole plant viscidly pruinose-puberulent, a span or two high: flowers nearly sessile or the lower ones short-pedicelled: *calyx* bibracteolate, *almost* 5-*parted* into linear-lanceolate lobes, fully half the length of the ample (*inch or more long*) purplish corolla: *anthers very woolly.* — Gravelly plains and pine woods, W. Texas to Arizona, extending into S. Colorado.

4. **A. Ludovicianum,** Gray. Rather less pubescent: spikes more frequently compound: *calyx less deeply and somewhat unequally* 5-*cleft: corolla about half smaller;* upper lip sometimes almost entire: *anthers* (before dehiscence) *glabrous or nearly so.* — *Phelipæa Ludoviciana,* Walp. From the Saskatchewan to Texas and westward.

Order 58. LENTIBULARIACEÆ. (Bladderwort Family.)

Herbs, growing in water or wet soil, with scapes or scapiform peduncles simple and one to few-flowered, calcarate corolla always and calyx usually bilabiate, a single pair of stamens, confluently one-celled anthers contiguous under the broad stigma.

1. UTRICULARIA, L. Bladderwort.

Calyx 2-parted or deeply 2-lobed; lobes mostly entire, nearly equal: upper lip of strongly bilabiate and more or less personate corolla erect: filaments thick, strongly arcuate-incurved, the base and apex contiguous. — Ours are aquatic, with the dissected leaves, branches, and even roots, bearing little bladders, which are furnished with a valvular lid, and commonly tipped with a few bristles at orifice, and yellow flowers. The scapes are leafless, emersed from submersed or floating leafy stems, which are free swimming and mostly rootless in deep water.

* *Pedicels recurved in fruit.*

1. **U. vulgaris,** L. Stems long and *rather stout, densely leafy: leaves* 2 *to* 3*-pinnately divided,* very bladdery: *scapes a foot or less long,* 5 *to* 16*-flowered: corolla half-inch or more broad,* with sides of lips reflexed; palate prominent: *spur conical,* porrect toward the slightly 3-lobed lower lip. — From Newfoundland to the Saskatchewan and Texas, and westward across the continent.

2. **U. minor,** L. *Leaves scattered on the filiform stems, repeatedly dichotomous, small, setaceous: scapes* slender, 3 *to* 7 *inches high,* 2 *to* 8*-flowered:* corolla pale yellow, 2 *or* 3 *lines broad,* ringent; palate depressed: *spur very short and obtuse.* — Across the continent.

* * *Pedicels erect in fruit.*

3. **U. gibba,** L. Branches delicate, root-like: leaves sparse, sparingly dissected, capillary, sparingly bladder-bearing: scape filiform, 1½ to 3 inches high, 1 to 2-flowered: corolla 3 lines broad; the lips broad and rounded: spur thick and conical, shorter than the lower lip and approximate to it. — In a subalpine pond in Colorado, *Greene.* Also in the Atlantic States.

Order 59. VERBENACEÆ. (Vervain Family.)

Herbs or shrubs, with chiefly opposite or verticillate leaves, no stipules, bilabiate or almost regular corolla, mostly didynamous stamens, single style with one or two stigmas, an undivided 2 to 4-celled ovary. — In ours the inflorescence is simple, commonly spicate or capitate with flowers alternate, and the leaves are simple.

1. **Verbena.** Calyx narrow, tubular, plicately 5-angled, 5-toothed. Corolla salverform; the limb somewhat equally or unequally 5-lobed. Fruit separating into 4 nutlets.
2. **Lippia.** Calyx ovoid, oblong-campanulate or compressed and bicarinate, 2 to 4-cleft or toothed. Limb of corolla oblique or bilabiate, 4-lobed. Fruit separating into 2 nutlets.

1. VERBENA, Tourn. VERVAIN.

Some mere weeds, others ornamental, and many spontaneous hybrids.

* *Flowers small or comparatively so, in narrow spikes: anthers unappendaged.*

+ *Bracts inconspicuous, not exceeding the flowers.*

1. **V. hastata,** L. Tall, 3 *to* 6 *feet high: pubescence short, sparse and hirsute or scabrous:* leaves oblong-lanceolate gradually acuminate, *coarsely or incisely serrate, petioled,* some of the lower commonly hastate 3-lobed at base: spikes numerous in a panicle, dense, *naked at base or more or less peduncled:* corolla blue. — In waste grounds and along roadsides, across the continent.

2. **V. stricta,** Vent. Erect, *rather stout, a foot or two high: pubescence softer and denser: leaves cinereous with dense soft hirsute-villous pubescence,* thickish, rugose-veiny, ovate or oblong, *nearly sessile, very sharply and densely mostly doubly serrate,* rarely incised: spikes comparatively thick, dense both in flower and fruit, canescent, *mostly sessile or leafy-bracted at base*: corolla blue, 4 or 5 lines long. — From New Mexico to Dakota and eastward to Texas and Ohio.

+ + *Bracts rigid and somewhat foliaceous, exceeding the flowers.*

3. **V. bracteosa,** Michx. Much branched from the base, diffuse or decumbent, hirsute: leaves cuneate-oblong or cuneate-obovate, narrowed mostly into a short margined petiole, pinnately incised or 3-cleft, and coarsely dentate: spikes terminating the branches: lowest bracts often pinnatifid or incised; the others lanceolate, acuminate, entire, rigid: corolla purplish or blue, very small. — Across the continent.

* * *Flowers more showy, at first depressed-capitate, becoming spicate in fruit: anthers of the larger stamens appendaged by a gland on the connective: tube of corolla at the upper part lined with reflexed bristly hairs.*

4. **V. bipinnatifida,** Nutt. A span to a foot high, *hispid-hirsute,* rooting from subterranean branches: *leaves* 1½ *to* 4 *inches long, bipinnately parted, or* 3*-parted into more or less bipinnatifid divisions:* bracts setaceous-attenuate, *mostly surpassing the calyx: limb of* the bluish-purple or lilac *corolla* 4 *or* 5 *lines broad;* lobes obcordate: *commissure of the nutlets usually retrorsely scabrous or hispidulous.* — Plains and prairies, from Arkansas and Texas to the mountains of Colorado.

5. **V. Aubletia,** L. A foot or less high, branching and ascending from a creeping or rooting base, *soft-pubescent, hirsute, or glabrate: leaves* 1 *or* 2 *inches long,* ovate or ovate-oblong in outline, *with truncate or broadly cuneate base* tapering into a margined petiole, *incisely lobed and toothed,* often more deeply 3-cleft: bracts subulate or linear-attenuate, *shorter than or equalling the calyx: limb of* the reddish-purple or lilac (or white) *corolla* ½ *or* ⅔ *inch broad: commissure of the nutlets minutely white-dotted or nearly smooth.* — From the Rocky Mountains eastward across the continent.

2. LIPPIA, L.

In ours the flowers are capitate or in short dense spikes, subtended and imbricated by broad bracts; the peduncles chiefly axillary.

1. **L. cuneifolia,** Steud. Diffusely branched, *procumbent (not creeping)*, minutely canescent throughout: *leaves rigid*, cuneate-linear, *sessile, incisely 2 to 6-toothed above the middle: peduncles mostly shorter than the leaves:* bracts rigid, broadly cuneate, abruptly acuminate from the truncate or retuse dilated summit: calyx-lobes emarginate: corolla white (?). — On the plains from Nebraska to New Mexico and Arizona.

2. **L. lanceolata,** Michx. *Creeping extensively*, some branches ascending, minutely and sparsely strigulose: *leaves thinner*, varying from obovate and lanceolate-spatulate to ovate, *narrowed at base mostly into a petiole, above sharply serrate: peduncles much exceeding the leaves:* bracts mucronate or pointless: calyx-lobes linear-lanceolate: corolla bluish-white. — From E. Colorado and Texas to Pennsylvania and Florida.

Order 60. LABIATÆ. (Mint Family.)

Chiefly herbs, with aromatic foliage, square stems, opposite leaves, more or less bilabiate corolla, didynamous or diandrous stamens, and a deeply 4-lobed ovary, which forms in fruit 4 seed-like nutlets, surrounding the base of the single style. — Upper lip of the corolla 2-lobed or entire: the lower 3-lobed. Stamens inserted on the tube of the corolla. Style 2-lobed at apex. Flowers axillary, chiefly in cymose clusters, these often aggregated in terminal spikes or racemes.

Tribe I. Stamens 4, ascending, mostly exserted from the upper side of the corolla: calyx 5 to 10-nerved. — Ajugoideæ.

1. **Teucrium.** Corolla deeply cleft between the two small lobes of the upper lip, which are united one on each side with the lateral lobes of the declined lower lip; middle lobe much larger. Stamens exserted from the cleft: anthers confluently one-celled.

Tribe II. Stamens not declined; the posterior pair shorter or wanting; anthers 2-celled; the cells distinct or confluent, short: corolla less strongly bilabiate and the lobes flatter than in succeeding tribes; upper lip not galeate or concave.

* Corolla about equally 4-lobed, small and short, hardly irregular, but the upper lobe broader than the others and emarginate: stamens erect, straight and distant: flowers capitate-glomerate, and the clusters sometimes confluent-spiked.

2. **Mentha.** Stamens 4, similar and nearly equal. Calyx 5-toothed. Upper lobe of corolla sometimes emarginate.

3. **Lycopus.** Stamens only 2 with anthers; the upper pair sterile rudiments, or else wanting. Calyx 4 to 5-toothed, naked in the throat. Upper lobe of corolla entire.

* * Corolla more or less evidently bilabiate; the upper lip erect, entire or emarginate, or 2-cleft in No. 5; the lower spreading and 3-cleft.

+ Stamens 4, didynamous, distant and straight, often divergent, never convergent nor curved: calyx 10 to 15-nerved: flowers capitate-verticillastrate, or sometimes sparser.

4. **Pycnanthemum.** Calyx ovate-oblong or tubular; the 5 teeth equal, or the 3 upper more or less united. Corolla with entire or barely emarginate upper lip, and 3-cleft lower one. Stamens little unequal: anther-cells parallel.

5. **Monardella.** Calyx tabular, narrow; the 5 teeth equal or nearly so. Corolla with 2-cleft upper lip, and 3-parted lower one. Stamens strongly or moderately unequal, exserted: anther-cells often divergent or divaricate. Flowers densely capitate-verticillastrate.

← ← Stamens ascending or arcuate, often more or less converging and sometimes ascending parallel under the erect upper lip of the corolla ; anther-cells oblique or divaricate: calyx 12 to 15-nerved.

6. **Calamintha.** Calyx oblong or tubular, often gibbous, bilabiate ; the upper lip 3-toothed or 3-cleft, the lower 2-parted. Corolla with a straight tube mostly exceeding the calyx, and a commonly enlarging throat. Stamens 4, ascending parallel under or beyond the upper lip, or conniving in pairs.
7. **Hedeoma.** Calyx from tubular to oblong, usually gibbous, more or less bilabiate or unequally 5-toothed, mostly 13-striate, hairy or villous-bearded in the throat. Antheriferous stamens 2, ascending parallel under the upper lip; the posterior pair either none or sterile.

Tribe III. Antheriferous stamens only 2, straight or commonly parallel-ascending; the anther with narrow cells, which are either widely separated on the upper and lower ends of a linear or filiform connective, or the lower cell wanting or deformed, or the two cells confluent into one linear cell : corolla bilabiate. — MONARDEÆ.

8. **Salvia.** Calyx bilabiate. Corolla with upper lip erect, straight or falcate, usually concave; the lower spreading, its middle lobe often emarginate. Connective commonly linear or filiform, transverse and articulated on the short filament.
9. **Monarda.** Calyx elongated-tubular, mostly 15-nerved, regular or nearly so, almost equally 5-toothed. Corolla with slender tube or dilated at the throat; the upper lip erect, entire or emarginate ; the lower spreading, 3-lobed, its middle lobe larger or longer, retuse or emarginate. Anther-cells contiguous and divaricate, more or less connate or confluent at their junction, so as to imitate a single linear cell.

Tribe IV. Stamens 4, both pairs fertile ; the posterior (inner or upper) pair surpassing the anterior : corolla distinctly bilabiate : calyx usually 15-nerved ; the upper teeth or lip commonly larger or longer. — NEPETEÆ.

10. **Lophanthus.** Stamens divergent or distant, exserted ; the upper pair usually declined ; the lower or shorter pair ascending : the anther-cells parallel or nearly so. Corolla with tube not exceeding the oblique, 5-toothed calyx ; upper lip nearly erect, 2-lobed at the apex ; lower spreading, its broad middle lobe crenate.
11. **Dracocephalum.** Anthers more or less approximate in pairs ; their cells divaricate or divergent : filaments not exserted. Calyx equal at throat, 5-toothed ; the upper tooth very much larger than the others. Corolla with dilated throat ; upper lip somewhat concave, emarginate or 2-lobed ; lower spreading, with middle lobe large.

Tribe V. Stamens 4, ascending and parallel ; the anterior (lower or outer) pair longer and with anthers mostly 1-celled by abortion ; those of the posterior pair 2-celled : corolla bilabiate ; but with the small lateral lobes more connected with the galeate upper lip ; lower lip therefore of a single lobe : calyx bilabiate ; its lips entire. — SCUTELLARINEÆ.

12. **Scutellaria.** Calyx gibbous, with a crest-like or hump-shaped projection on the back, closed after the corolla falls, not inflated. Corolla with long exserted tube. Anthers ciliate-pilose.

Tribe VI. Stamens 4 ; parallel and ascending under the concave and commonly galeate upper lip of the bilabiate corolla ; the anterior (lower or outer) pair longer : anthers 2-celled or confluently somewhat 1-celled. Calyx 5 to 10-nerved, veiny. — STACHYDEÆ.

13. **Physostegia.** Calyx nearly regular, and equally 5-toothed ; the tube campanulate or oblong, hardly nerved or veined, moderately inflated in fruit. Corolla gradually inflated upward ; upper lip erect, rounded, entire ; lower somewhat spreading, 3-parted, its roundish middle lobe emarginate. Filaments villous. Flowers simply opposite in the spikes, one under each bract.
14. **Stachys.** Calyx tubular-campanulate or turbinate, 5 to 10-nerved, equally 5-toothed, sometimes the upper teeth larger. Corolla with cylindrical tube, not dilated at throat ; upper lip erect, more or less concave, entire or emarginate ; lower spreading, 3-lobed. Stamens more or less deflexed to the sides of the throat or contorted after anthesis : filaments naked : anthers approximate in pairs.

1. TEUCRIUM, L. Germander.

Herbs: less aromatic than most genera, with leaves variously cut and flowers spicate or solitary and axillary.

* *Leaves undivided: flowers in naked terminal spikes or racemes: calyx moderately 5-lobed; two lower teeth triangular-subulate; three upper ovate.*

1. **T. occidentale,** Gray. Loosely pubescent, branched, a foot or two high: leaves 1 or 2 inches long, ovate-oblong to broadly lanceolate, sharply serrate: corolla 4 or 5 lines long, purple, rose or cream-color: calyx villous with viscid hairs. — Synopt. Fl. ii. 349. *T. Canadense* of the Western Reports. Nebraska to New Mexico and California.

* * *Leaves multifid or incised: flowers solitary and axillary, the uppermost leaves more or less bract-like: calyx almost 5-parted into subulate-lanceolate equal lobes.*

2. **T. laciniatum,** Torr. Glabrous or hirsute-pubescent, much branched, a span or so high: leaves pinnately 3 to 7-parted into narrow linear entire or 2 to 3-lobed or toothed divisions, rather rigid; the floral much crowded, 3-parted: corolla 6 to 10 lines long, pale blue or lilac, with spatulate lower lobe much surpassing the calyx. — Ann. Lyc. N. Y. ii. 231. Plains of Colorado to Arizona and W. Texas.

2. MENTHA,[1] Tourn. Mint.

Odorous herbs, mostly spreading by slender creeping rootstocks: flowers small, whitish or purplish, in ours glomerate in the axils of leaves.

1. **M. Canadensis,** L. Villous-hairy: stem often simple: leaves varying from oblong-ovate to oblong-lanceolate, sharply serrate, acute, generally tapering into the petiole: inflorescence consisting of distant sessile verticillastrate glomerules in the axils of the leaves, the uppermost axils flowerless: calyx hairy; the short teeth triangular-subulate. — Wet places, throughout the continent, chiefly towards the north. Odor of Pennyroyal.

Var. **glabrata,** Benth., has leaves and stem almost glabrous, the former sometimes very short-petioled, and a sweeter scent, as of *Monarda.* — Same range.

3. LYCOPUS, Tourn. Water Horehound. Bugle-weed. Gypsy-wort.

Mint-like, but bitter and only slightly aromatic; with sharply toothed or lobed leaves, and small white or whitish flowers in their axils, in sessile capitate-verticillastrate glomerules, the uppermost axils flowerless.

* *Stoloniferous; long filiform runners produced from the base of the stem: calyx-teeth mostly 4.*

1. **L. Virginicus,** L. Glabrous or somewhat pubescent: *stem obtusely angled,* 6 to 24 inches high: leaves ovate or oblong-lanceolate, *coarsely serrate*

[1] Doubtless some of the common introduced species have become established within our range.

in the middle, acuminate at both ends, tapering into a short petiole: bracts very short: calyx-teeth ovate or lanceolate-ovate, obtuse or barely acutish: sterile stamens minute rudiments. — From British Columbia and Oregon to Florida and Labrador.

2. **L. lucidus,** Turcz. Stem strict, stout, 2 or 3 feet high, hirsute-pubescent or glabrate, *acutely angled above:* leaves lanceolate and oblong-lanceolate, 2 to 4 inches long, acute or acuminate, *very sharply and coarsely serrate with triangular-subulate ascending teeth, sessile or nearly so by an obtuse or acute base,* coarsely punctate: outer bracts conspicuous, very acute: calyx-teeth attenuate-subulate: sterile stamens clavate-tipped rudiments.

Var. **Americanus,** Gray. Leaves dull, often minutely puberulent both sides: calyx-teeth less rigid. — Bot. Calif. i. 592. From the Saskatchewan to Arizona and California.

* * *Not stoloniferous, but rootstocks more or less creeping: calyx-teeth* 5, *cuspidate, rigid.*

3. **L. sinuatus,** Ell. Stem erect, 1 to 3 feet high, acutely 4-angled, glabrous, roughish or minutely pubescent: leaves oblong or lanceolate, 1½ or 2 inches long, acuminate, irregularly incised or laciniate-pinnatifid, or some of the upper merely sinuate or incisely toothed, tapering at base mostly into a slender petiole: rudiments of sterile stamens slender, conspicuous, with a globular or subclavate tip. — *L. Europæus,* var. *sinuatus,* Gray. Across the continent.

4. PYCNANTHEMUM, Michx. Mountain Mint. Basil.

Erect herbs, pleasantly aromatic, branching above; flowers small, whitish or purplish, often purple-dotted. In ours the flowers are in small and numerous glomerules which are capitate and densely fastigiate-cymose, copiously imbricated with short appressed bracts.

1. **P. lanceolatum,** Pursh. Stem somewhat pubescent: inflorescence villous-canescent: leaves lanceolate or almost linear, nervose-veined, obtuse at base, nearly sessile, entire: bracts ovate or lanceolate: calyx-teeth ovate-deltoid, acute. — Within the eastern limit of our range, and extending from thence eastward across the continent.

5. MONARDELLA, Benth.

Flowers in terminal and solitary verticillastrate heads, subtended or involucrate by broad often membranaceous and colored bracts: corolla from whitish or flesh-color to rose-purple.

1. **M. odoratissima,** Benth. Cinereous-puberulent or minutely tomentulose, or nearly glabrous, but pale: a span to a foot high: leaves from narrowly oblong to broadly lanceolate, entire or nearly so, short-petioled, or the upper subsessile, both sides alike: bracts thin-membranaceous and colored (whitish or purple): calyx-teeth hirsute. — Sierra Madre Range in Colorado, and thence westward and northward. Odor of Pennyroyal.

6. CALAMINTHA, Tourn., Mœnch. Calamint.

Our species belongs to a section with flowers verticillastrate-capitate, and involucrate with conspicuous setaceous-subulate rigid bracts.

1. **C. Clinopodium,** Benth. Herbaceous, hirsute: leaves ovate, obtuse, almost entire, petioled: heads globular, many-flowered: teeth of the narrow tubular calyx and bracts very hirsute, nearly equalling the light purple narrow corolla. — Indigenous from the Rocky Mountains to the Great Lakes, but introduced eastward. "Basil."

7. HEDEOMA, Pers. American Pennyroyal.

Our species belong to the section with pedicellate flowers cymulose in the axils of the leaves, the uppermost of which are often bract-like: throat of the calyx in fruit closed with a ring of hair. Pungently sweet-aromatic, with small and whitish or purplish flowers.

1. **H. hispida,** Pursh. Mostly low: *leaves all similar, linear,* entire, thickish, nearly sessile, *crowded, almost glabrous,* but the margins somewhat hispid-ciliate: bracts mostly equalling the calyx, rigid: *calyx with teeth about equal, bilabiate;* the lips about half the length of the oblong gibbous hispid tube; the teeth of the upper subulate, of the lower more aristiform or hispid, *equalling the bluish corolla.* — Extending into Dakota and southward from the plains west of the Mississippi.

2. **H. Drummondi,** Benth. *Cinereous pubescent or puberulent,* a span or two high, copiously branched: *leaves from oblong to linear,* obtuse, subsessile or narrowed into a very short petiole: subulate bracts not longer than the pedicels: calyx hirsute or hispid, in age more or less curved, *not plainly bilabiate;* the subulate-setaceous teeth at length all connivent; *the lower nearly twice the length of the upper: corolla from little exserted to double the length of the calyx.* — From Texas to Arizona and extending northward to Colorado and Nebraska.

8. SALVIA, L. Sage.

In ours the throat of the calyx is naked: the anterior portion of the connective deflexed, linear or gradually somewhat dilated downward, closely approximate or connate, and destitute of an anther-cell: corolla blue or purplish varying to white.

1. **S. azurea,** Lam. Glabrous or puberulent, 1 to 5 feet high: lower leaves lanceolate or oblong, obtuse, denticulate or serrate; upper narrower, often linear, entire: inflorescence spiciform, interrupted, sometimes thyrsoidal or paniculate-branched: *calyx obscurely bilabiate: corolla deep blue, with prominently exserted tube;* upper lip very concave or galeate and pubescent; *the lower longer and much larger,* sinuately 3-lobed and emarginate: *style bearded above.*

Var. **grandiflora,** Benth. Cinereous-puberulent: denser inflorescence and calyx tomentulose-sericeous. — *S. Pitcheri,* Torr. From Colorado to Texas and Kansas.

2. **S. lanceolata,** Willd. Puberulent or nearly glabrous, branched from the base, 5 to 12 inches high: leaves lanceolate or linear-oblong, obtuse, irregu-

larly serrate with obtuse appressed teeth or nearly entire: inflorescence virgate-spiciform, interrupted, floral bracts very small: *calyx deeply bilabiate: corolla small, 4 lines long, hardly at all exserted; lower lip little prolonged: style glabrous or nearly so.* — Plains, Nebraska to Texas and Arizona.

9. MONARDA, L. Horse-Mint.

Aromatic erect herbs, usually tall; with the large verticillastrate-capitate glomerules single, or in upper axils, and involucrate by numerous sometimes colored outer bracts and floral leaves.

* *Heads solitary and terminal, or sometimes 2 or 3 as if proliferous: stamens and style conspicuously exserted from the linear and mostly acute upper lip of the corolla: leaves ovate-lanceolate, acutely more or less serrate.*

1. **M. fistulosa,** L. Soft-pubescent with short hairs, or somewhat hairy, or glabrate: stem mostly with obtuse angles: bracts whitish or rarely purplish, the inner mostly hirsute-ciliate: calyx conspicuously and densely bearded at the throat: corolla pubescent, at least on the upper lip, purple or purplish-dotted, an inch or more long. — Nearly across the continent. A polymorphous species.

Var. **media,** Gray. Corolla deep purple. — Synopt. Fl. ii. 374. Alleghany and Rocky Mountains.

Var. **mollis,** Benth. Corolla from flesh-color to lilac, glandular, and its upper lip hairy outside or more bearded at the tip: leaves paler, soft pubescent beneath: throat of the calyx mostly filled with dense beard. — Extending to the Saskatchewan, British Columbia, and Arizona.

* * *Heads commonly in the axils of all the upper pairs of leaves, or interrupted-spicate, foliose-bracteate: upper face of the floral leaves often canescent and purple-tinged: corolla with shorter tube, more dilated throat; the upper arching seldom surpassed by the stamens: leaves lanceolate or oblong, sparsely serrate or denticulate.*

2. **M. punctata,** L. Stem commonly 2 feet high: floral leaves and *bracts* (either whitened or purplish or both) *often slender acuminate,* mostly muticous: *calyx-teeth lanceolate- or triangular-subulate,* rigid, soon stellate-spreading: *corolla yellowish with copious brown-purple spots.* — From Colorado to Florida and New York.

3. **M. citriodora,** Cerv. Usually rather robust, the larger forms 2 or 3 feet high: bracts narrowly oblong, colored as in the last, with spreading or recurving and *slender aristate tips: calyx-teeth slender-aristiform,* at length usually spreading: *corolla white or pinkish, not spotted, but more or less punctate.* — *M. aristata,* Nutt. Plains of Nebraska to Texas, E. Colorado, and Arizona

10. LOPHANTHUS, Benth.

Mostly tall and coarse herbs: with serrate petioled leaves, the lower usually subcordate and the upper ovate, and small flowers in dense and sessile verticillastrate glomerules, which are crowded into a terminal spike: floral leaves

reduced to short ovate and acuminate bracts: calyx-teeth more or less colored.

1. **L. anisatus,** Benth. Glabrous or very minutely puberulent, 2 or 3 feet high: leaves ovate, often subcordate, *canescent beneath, anisate-scented when crushed:* spike short and narrow, interrupted, sometimes leafy below and paniculate: calyx-teeth ovate-lanceolate and *merely acute,* tinged with purple or violet: *corolla blue.* — Plains, from the Saskatchewan to Nebraska and westward to the mountains.

2. **L. urticifolius,** Benth. Like the last, but leaves green both sides, mostly crenate and more or less cordate, sweet-aromatic: calyx-teeth lanceolate, *subulate-acuminate: corolla light violet or purplish.* — Western slopes of the mountains to Oregon and California.

11. DRACOCEPHALUM, Tourn. Dragon-head.

Herbs, peculiar for the small and included corolla.

1. **D. parviflorum,** Nutt. Rather stout, 6 to 20 inches high, somewhat pubescent: leaves lanceolate or oblong, petioled, incisely dentate, or the lower pinnatifid-incised; the lower floral similar: flowers numerous in sessile glomerules crowded in a thick terminal leafy-bracted head or short spike interrupted at base: bracts pectinate-laciniate and the teeth aristate: corolla bluish, slender, hardly exceeding the calyx. — New York to British Columbia, and southward along the mountains to New Mexico.

12. SCUTELLARIA, L. Skullcap.

Flowers mostly blue, solitary in the axils of the leaves, or in spikes or racemes from the reduction of the floral leaves to bracts.

* *Flowers small (¼ inch long), in axillary and sometimes also terminal racemes.*

1. **S. lateriflora,** L. Glabrous, a foot or two high, leafy: leaves thin, oblong-ovate and ovate-lanceolate, acuminate, coarsely serrate, rounded at base, slender petioled; the lower floral ones of the terminal racemes similar: lips of the corolla short, equal in length. — From Oregon to New Mexico and eastward across the continent.

* * *Flowers solitary in the axils of the cauline leaves, or some occasionally imperfectly racemose, violet-blue.*

2. **S. resinosa,** Torr. *Barely a span high,* branched from the base, minutely pubescent and *resinous atomiferous,* somewhat viscid: leaves uniform, *oval or oblong, obtuse,* mostly sessile, 5 *to* 10 *lines long,* nervose-veined: corolla pubescent, *an inch long,* with slender tube and ampliate throat. — Plains of Nebraska, Wyoming, and Colorado.

3. **S. galericulata,** L. Nearly glabrous or slightly pubescent, slender, 1 *to* 3 *feet high,* simple or paniculately branched above: *leaves ovate-lanceolate,* broadest next the subsessile subcordate base, 2 *inches or less long,* all but the upper appressed-serrate: corolla puberulent, ½ *to* ⅔ *inch long;* lower lip nearly erect and surpassing the upper. — From British Columbia to Arizona and eastward across the continent.

13. PHYSOSTEGIA, Benth. False Dragon-head.

Almost glabrous herbs: with lanceolate and callose-denticulate or serrate leaves; the upper ones sessile, lowest tapering into a petiole, floral reduced to bracts of the simple or panicled spikes. Flowers cataleptic (remaining in whatever position they may be turned). Corolla showy rose or flesh-color, often variegated.

1. **P. parviflora,** Nutt. Stems rather slender, leafy, a foot or two high: leaves lanceolate or ovate-lanceolate, denticulate: spikes short, 1 to 4 inches long: calyx short-campanulate, inflated-globular in fruit and with short mostly obtuse teeth: corolla ½ inch long. — Saskatchewan and Wyoming to Oregon and British Columbia.

14. STACHYS, Tourn. Woundwort.

Flowers verticillastrate-capitate or clustered, or sometimes few or solitary in the axils of the floral leaves, forming usually an interrupted spicate inflorescence. In ours the corolla is purple or rose-red, not over ½ inch long; the tube not exceeding the calyx-teeth.

1. **S. palustris,** L. From densely soft-pubescent to roughish-hirsute, leafy: stem 1 to 3 feet high, hirsute or hispid: leaves ovate-lanceolate, crenate-serrate, 1½ to 3 inches long, sessile or nearly so by a broad or subcordate base, sometimes almost velvety-tomentose beneath: clusters of the spike mostly approximate, 6 to 10-flowered. — Across the continent.

Order 61. PLANTAGINACEÆ. (Plantain Family.)

Chiefly acaulescent herbs with one to several-ribbed or nerved radical leaves, simply spicate inflorescence, and regular 4-merous flowers, and the corolla scarious and veinless.

1. PLANTAGO, Tourn. Plantain. Ribwort.

Flowers perfect or polygamo-dioecious, each subtended by a bract: corolla salverform with a short tube, or nearly rotate: stamens 4 or sometimes 2, on the tube of the corolla: ovary 2-celled, with one or more ovules in each cell: capsule circumscissile toward the base: scape from the axils of the radical leaves, mostly bearing a single simple spike or head of greenish or whitish small flowers.

* *Stamens* 4: *flowers all perfect: corolla remaining expanded, never closed over the fruit.*

+ *Leaves* 3 *to* 8*-nerved or ribbed, varying from glabrous to pubescent, from lanceolate to almost rotund.*[1]

1. **P. major,** L. *Leaves ovate or oval, rarely subcordate, several-ribbed:* spike commonly dense, obtuse at apex: sepals rotund-ovate or obovate; the

[1] The introduced *P. lanceolata,* L., may be known by its oblong-lanceolate 3 to 5-ribbed leaves, tapering into a slender petiole, usually much shorter than the slender and angled

exterior one and the bract more or less carinate: capsule ovoid, very obtuse, circumscissile near the middle and near the level of the summit of the sepals. — Introduced to the east, but also native from Lake Superior westward and northward. "Common Plantain."

2. **P. eriopoda,** Torr. *Usually a mass of yellowish wool at the crown: leaves oblanceolate* to oval-obovate, fleshy-coriaceous, 3 *to* 7-*nerved*, 3 to 5 inches long, with a short or stout petiole: spike cylindrical, dense or sometimes sparsely-flowered: sepals roundish-obovate, scarious except the midrib: capsule ovoid, slightly exceeding the calyx. — From Colorado to California and northward to Wyoming and the Saskatchewan.

+ + *Leaves* 1 *to* 3-*nerved, silky-pubescent or lanate, from narrowly linear to oblanceolate.*

3. **P. Patagonica,** Jacq. Silky-lanate or glabrate: leaves acute or callous-pointed, tapering below into a petiole, entire or sparingly denticulate: scape terete, 3 to 12 inches high including the dense spike: flowers heterogonous, often cleistogamous: sepals very obtuse: corolla with broad cordate or ovate lobes: filaments in the long-stamened individuals capillary and much exserted: in the other forms included. — Dry plains, from the Mississippi westward across the continent. Exceedingly variable, including many forms that have been described as species. The following are the principal forms which abound west of the Mississippi:

Var. **gnaphalioides,** Gray, is the commoner form, canescently villous, the wool often floccose and deciduous: leaves from oblong-linear or spatulate-lanceolate to nearly filiform: spike very dense, 1 to 4 inches long, varying to capitate and few-flowered, lanate: bracts oblong or linear-lanceolate, or the lowest deltoid-ovate, hardly longer than the calyx.

Var. **spinulosa,** Gray, is a canescent form with aristately prolonged and rigid bracts.

Var. **nuda,** Gray, has sparse and loose pubescence, green and soon glabrate rigid leaves, and short bracts.

Var. **aristata,** Gray, is loosely villous and glabrate: leaves green: bracts attenuate-prolonged to twice or thrice the length of the flowers.

* * *Stamens* 2: *flowers subdiœcious or diœcio-cleistogamous: corolla in the fertile plant remaining closed or closing over the maturing capsule and forming a kind of beak: leaves linear or filiform.*

4. **P. pusilla,** Nutt. Somewhat cinereous-puberulent: leaves about an inch long and half a line wide: spike filiform or slender, at length sparse-flowered, ½ to 3 inches long: capsule short-ovoid, about a line long, little exceeding the bract and calyx. — From the Atlantic States west to Nebraska; also in the Great Basin and Oregon.

scape; its spike at first capitate, in age cylindrical, dense; the bract and sepals broadly ovate, brownish. — Generally in cultivated fields. "Ripple- or Rib-grass," "English Plantain."

Division III. APETALÆ.

Floral envelope consisting only of a calyx (often petaloid), or wholly wanting.

Order 62. **NYCTAGINACEÆ.** (Four-o'clock Family.)

Herbs, with mostly opposite and entire leaves, stems tumid at the joint, a delicate tubular or funnel-form calyx which is colored like a corolla, its persistent base constricted above the 1-celled, 1-seeded ovary, and indurated into a sort of nut-like pericarp; the stems few, slender and hypogynous; the embryo coiled around outside the mealy albumen.

* Involucre calyx-like, 3 to 5-cleft or -parted, 1 to 12-flowered: perianth tubular to funnel-form or campanulate.

1. **Mirabilis.** Involucre 5-lobed, not changed in fruit. Fruit not angled nor winged, and scarcely or not at all ribbed. Stamens usually 5.
2. **Oxybaphus.** Involucre 5-lobed, 1 to 5-flowered, in fruit becoming enlarged, thin and reticulated. Fruit several-ribbed or angled. Stamens usually 3.
3. **Allionia.** Involucre deeply 3-lobed, 3-flowered. Fruit with a double line of tubercles on the back, surrounded by a rigid winged margin, toothed and inflexed. Stamens usually 3.

* * Involucre of 5 or more distinct bracts, subtending a many-flowered head.

4. **Abronia.** Perianth salver-form, including the stamens and style. Fruit wing-angled.

1. MIRABILIS, L. Four-o'clock.

Stamens as long as the perianth: filaments united at base. Stigma capitate, granulate. Fruit globose to ovate-oblong. — Perennial herbs, with opposite leaves nearly equal in the pairs: peduncles solitary in the axils or paniculate: flowers nearly sessile in the involucres.

* *Involucre usually* 6-*flowered: flowers large: calyx long-tubular or funnelform: stamens* 4 *to* 5.

1. **M. multiflora,** Gray. Stout and spreading: leaves broadly ovate to ovate-lanceolate, often somewhat cordate at base but decurrent upon the petiole: involucre glabrous, campanulate, 5-cleft: flowers pale rose-color to purple, with the tube somewhat greenish, 1½ to 2 inches long. fruit marked towards the base by ten shallow furrows and as many intermediate dark lines. — Bot. Mex. Bound. 173. From Colorado to the Rio Grande and westward to S. California.

* * *Involucre* 3-*flowered. flowers rather small: calyx broad-funnelform from a short tube: stamens* 3.

2. **M. oxybaphoides,** Gray. Slender, procumbent, diffuse: leaves all deeply cordate, on rather long petioles, lowest reniform, upper ones acuminate: involucre deeply 5-cleft, very viscid-glandular as well as the peduncles in the loose panicle. — S. Colorado and southward.

2. OXYBAPHUS, Vahl.

Calyx with a very short tube and a bell-shaped (rose or purple) deciduous limb, plaited in the bud. Style filiform: stigma capitate. — Herbs, with very large and thick perennial roots, and mostly clustered small flowers. Ours all have pubescent fruit and involucres 3 to 5-flowered.

1. **O. nyctagineus,** Sweet. *Nearly smooth:* stem repeatedly forked: *leaves all petioled, varying from ovate or somewhat heart-shaped to lanceolate: fruit rather hirsute.* — From Illinois, Wisconsin, and the Upper Missouri to Texas and New Mexico.

Var. **Cervantesii,** Gray. *Branches and involucres viscid-pubescent or villous:* leaves much thicker, cordate or subcordate at base. — Bot. Mex. Bound. 174. S. Colorado and southward.

Var. **oblongifolius,** Gray. *Leaves ovate-lanceolate or oblong, not cordate.* — Loc. cit. Near Denver and southward.

2. **O. hirsutus,** Sweet. One foot high, *very densely pilose,* with long, spreading, articulated hairs: *leaves lanceolate, the lower short-petioled:* involucre pubescent-tomentose: *fruit hirsute.* — From the Saskatchewan to Colorado and W. Texas.

3. **O. angustifolius,** Sweet. One to six feet high, *glabrous except the peduncles and involucres* which are pubescent: *leaves linear,* usually elongated, glaucous: *fruit hoary-pubescent.* — From Iowa and Minnesota to S. Idaho and southward to W. Texas and Mexico.

3. ALLIONIA, L.

Perianth with an oblique 4 to 5-lobed limb. Fruit ovate, compressed, smooth and convex on the inner side. — Annual or perennial herbs, with opposite very unequal leaves, and axillary pedunculate flowers.

1. **A. incarnata,** L. Stems slender, branching, prostrate: pubescence viscid, short or floccose: leaves ovate: lobes of the involucre concave: perianth rose-colored or white. — From S. Colorado to Texas, and westward to S. California.

4. ABRONIA, Juss.

Tube of the perianth elongated, and the limb of 5 (or 4) obcordate or emarginate segments. Stamens unequal, adnate to the tube. Fruit coriaceous or indurated, 1 to 5-winged, mostly reticulately veined, enclosing a smooth cylindrical akene. — Often prostrate, and usually more or less viscid-pubescent, with thick opposite unequal leaves, and elongated axillary and terminal peduncles: flowers usually very fragrant and showy.

* *Wings (if any) coriaceous, lateral and not completely encircling the fruit.*

1. **A. fragrans,** Nutt. Stems ascending: leaves oblong or ovate, truncate or more or less cuneate at base: peduncles elongated: bracts of the involucre large, broadly ovate, white and scarious: fruit narrowly 1 to 2-winged, not crested. — From Iowa to Salt Lake Valley and southward to Arizona and New Mexico.

* * *Wings membranous, orbicular, wholly encircling the fruit, strongly net-veined.*

2. **A. micrantha,** Torr. Prostrate: *peduncles shorter than the petioles*: *flowers small and inconspicuous,* reddish green, the limb scarcely 2 lines broad: fruit orbicular with 3 thin wings, *emarginate above and below, the body rather broad and with a light spongy exterior.* — On the plains from the Saskatchewan to the Arkansas and S. W. Colorado. Often confounded with the next, which is of more southern range.

3. **A. cycloptera,** Gray. *Stouter: flowers large and showy, upon elongated peduncles:* fruit with firmer and more prominently veined wing, *emarginate at neither end, the firm smooth narrow body* usually 3-nerved between the wings. — S. Colorado to New Mexico and W. Texas.

Order 63. ILLECEBRACEÆ.

An order related to both *Caryophyllaceæ* and *Amarantaceæ,* but placed by Bentham and Hooker with the latter. Distinguished from the scarious-stipulate *Caryophyllaceæ* by the solitary or sometimes geminate ovules, undivided or 2-cleft style, and one-seeded utricular or akene-like fruit: the petals wholly wanting or reduced to mere filaments; these and the stamens usually more perigynous.

1. PARONYCHIA, Tourn. Whitlow-wort.

Sepals 5, linear or oblong concave, awned at the apex. Stamens 5. — Tufted herbs, with dry and silvery stipules.

* *Flowers terminal, solitary and sessile.*

1. **P. pulvinata,** Gray. Matted-cespitose from a woody root, forming dense cushion-like tufts: *stipules* broadly ovate, *entire,* pointless: leaves thick, *oblong,* obtuse, *equalling the stipules,* and with them densely covering the short stems: flowers immersed among the leaves: *sepals oval,* awned a little below the apex. — Proc. Phil. Acad. 1863, 58. Alpine. Uinta Mountains, Rocky Mountains of Colorado, and southward.

2. **P. sessiliflora,** Nutt. Very densely cespitose from a woody root, much branched and crowded, branches very dense: *stipules 2-cleft:* leaves imbricated, *linear-subulate,* the lowest erect, obtuse, the upper longer, recurved, spreading, acute or mucronate, *longer than the stipules: sepals oblong-linear,* with divergent awns rather shorter. — Colorado and northward to the headwaters of the Missouri and the Saskatchewan.

* * *Flowers in crowded dichotomous cymes.*

3. **P. Jamesii,** Torr. & Gray. Very minutely scabrous-pubescent, cespitose, much branched from the base: stipules ovate-lanceolate, acuminate or setose: leaves longer, linear-subulate, obtuse, about the length of the internodes: cymes few-flowered, with a central subsessile flower in each division: sepals linear-oblong, with very short cusps. — Fl. i. 170. Colorado.

Order 64. AMARANTACEÆ. (Amaranth Family.)

Herbs with entire leaves destitute of stipules, small flowers which are usually subtended by scarious bracts and have a persistent perianth of 1 to 5 more or less scarious sepals (sometimes wanting in *Acnida*), hypogynous stamens as many as the sepals and opposite them or fewer, a 1-celled ovary containing a single ovule, utricular in fruit. Flowers perfect or unisexual, solitary or clustered, commonly 3-bracteate.

* Anthers 2-celled: flowers unisexual: leaves alternate.

1. **Amarantus.** Flowers monœcious or polygamous, all with a calyx of 3 or 5 (sometimes fewer) sepals.
2. **Acnida.** Flowers dicœcious. Calyx none in the fertile flowers.

* * Anthers 1-celled: flowers perfect: leaves opposite.

3. **Cladothrix.** Flowers minute, solitary or few in the axils. Filaments united at base into a cup. Densely stellate-tomentose, with petiolate leaves.
4. **Frœlichia.** Flowers spicate. Filaments united into a tube. Hairy or woolly, with sessile leaves.

1. AMARANTUS, Tourn. Amaranth.

Sepals distinct or united at base. Stigmas 2 or 3, linear and sessile. Utricle ovate, 2 to 3-beaked, circumscissile. — Annual weeds, with leaves thin and strongly veined, decurrent upon the slender petiole and apiculate with a short setaceous mucro: flowers green or purplish, in axillary or spiked clusters or spikelets. Staminate flowers usually mingled with the more numerous pistillate ones.

* *Sepals distinct, oblong-lanceolate, erect: flowers monœcious.*

+– *Flowers in naked terminal and axillary mostly panicled spikes: sepals* 5: *stems usually stout and erect, with long-petioled leaves.*

1. **A. retroflexus,** L. *Roughish and more or less pubescent: dull green, leaves large, ovate to rhombic-ovate:* flowers green, *in thick* erect or scarcely spreading *crowded spikes: bracts lanceolate,* attenuate to a rigid awn. — From Mexico to British America.

2. **A. Wrightii,** Watson. *Glabrous,* erect and slender, *reddish: leaves small* and thin, on slender petioles, *oblong to narrowly lanceolate: spike* erect, *narrow,* and rather leafy: *bracts* solitary, *subulate,* awned as in the last. — Proc. Am. Acad. xii. 275. Colorado, in the Upper Arkansas Valley, and New Mexico.

+– +– *Flowers in very small axillary spikes or clusters: sepals* 3: *stems low or prostrate, with smaller leaves.*

3. **A. albus,** L. *Erect or ascending,* diffusely branched from the base: leaves oblong-spatulate to obovate, obtuse or retuse: *bracts subulate, rigid, pungently awned, the lateral ones very much smaller or wanting:* sepals slightly shorter than the *rugose utricle: seed small, a third of a line broad.* — Watson, Proc. Am. Acad. xii. 274. Throughout the United States as an introduced weed, but doubtless indigenous within our range.

4. **A. blitoides,** Watson. Like the last, but *prostrate or decumbent:* spikelets usually contracted: *bracts ovate-oblong, shortly acuminate, nearly equal: utricle not rugose: seed nearly a line broad.* — Proc. Am. Acad. xii. 273. From Mexico to N. Nevada and Iowa. Known on the plains as "Rolling" or "Tumble Weed."

* * *Sepals* (5) *of the fertile flowers more or less dilated above and spreading, distinct or united at base: flowers sometimes diœcious: perianth deciduous with the fruit.*

5. **A. Torreyi,** Benth. Bracts scarcely as long as the flowers: sepals obovate-spatulate, rounded above and entire or retuse or emarginate; sepals of the male flowers (which are mingled with the pistillate ones or on distinct plants) oblong-lanceolate, acute. — *Amblogyne Torreyi*, Gray. Colorado, New Mexico, and southward.

2. ACNIDA, L. Water-Hemp.

Flowers 2 to 3-bracted. Staminate flowers of 5 thin oblong and mucronate-tipped sepals, longer than the bracts, and as many stamens with oblong anthers; the cells of the latter united only at the middle. Pistillate flowers with lanceolate awl-pointed bracts longer than the ovary: stigmas 2 to 5, bristle-awl-shaped. Fruit (in ours) a thin and membranaceous utricle, smooth and even. — An annual glabrous herb, mostly tall, with lanceolate or oblong-ovate leaves, on long petioles, and small clusters of greenish flowers, usually crowded into elongated and panicled interrupted spikes.

1. **A. tuberculata,** Moq. Stigmas very long, divergent, plumose-hispid. — *Montelia tamariscina*, Gray. Low grounds and moist sandy shores from Colorado to Vermont.

3. CLADOTHRIX, Nutt.

Flowers 3-bracted; bracts concave, hyaline. Perianth of 5 erect equal oblong rigid-scarious sepals, somewhat pilose with verticillately branched hairs. Anthers large, oblong. Utricle ovate-globose, indehiscent. — Low annual, or erect and woody at base, with small rounded entire petiolate leaves.

1. **C. lanuginosa,** Nutt. Prostrate or ascending, diffusely branched: leaves round-obovate to rhomboidal, more or less attenuate at base, often in threes: flowers mostly in pairs: sepals twice longer than the broader hairy-tipped bracts. — Bot. Calif. ii. 43. *Alternanthera* (?) *lanuginosa*, Torr. From S. California eastward through S. Colorado to Arkansas and Texas.

4. FRŒLICHIA, Mœnch.

Flowers 3-bracted. Calyx tubular, 5-cleft at the summit, below 2 to 5-crested lengthwise, or tubercled and indurated in fruit, enclosing the indehiscent thin utricle. Tube of filaments bearing 5 oblong anthers and as many sterile strap-shaped appendages. — Herbs with spiked, scarious-bracted flowers.

1. **F. Floridana,** Moq. Root annual: stem leafless above, 1 to 2 feet high: leaves lanceolate, silky-downy beneath: spikelets crowded into an interrupted spike: calyx very woolly. — Colorado and eastward to Illinois.

Order 65. **CHENOPODIACEÆ.** (Goosefoot Family.)

Herbs or shrubs, often succulent or scurfy, usually with simple and alternate leaves, without stipules; the small and sessile commonly clustered flowers either naked or with herbaceous (not scarious) bracts, a perianth of 5 or fewer usually herbaceous and persistent sepals; stamens as many as the sepals and opposite, distinct, with 2-celled anthers; ovary 1-celled, an akene or utricle in fruit. Flowers perfect or unisexual. Bracts often enclosing the fruit. — Watson, Proc. Am. Acad. ix. 82.

§ 1. Flowers perfect, without bracts; the perianth persistent: seed free, mostly with crustaceous testa.

* Seeds horizontal (sometimes vertical in *Chenopodium*).

1. **Kochia.** Perianth 5-cleft, at length transversely winged, enclosing the fruit. Testa membranous. Perennial, with terete leaves and axillary flowers.
2. **Cycloloma.** Perianth 5-cleft, in fruit surrounded by a horizontal continuous membranaceous wing. Annual, much-branched, with sinuate-toothed petioled leaves and small panicled clusters of sessile flowers.
3. **Chenopodium.** Perianth usually 5-cleft or -parted, nearly covering the fruit. Stamens 5, 1, or none. Annuals, mostly mealy or glandular, with clustered or solitary axillary or terminal flowers. Seeds often vertical.

* * Seeds vertical.

4. **Monolepis.** Sepal 1, bract-like. Stamen 1. Fruit naked. Low annuals; flowers densely clustered in the axils.

§ 2. Flowers monœcious or dicœcious; the staminate with 3 to 5-cleft perianth; the pistillate without perianth, enclosed in a pair of more or less united bracts: seed free, vertical.

* Bracts compressed: testa mostly coriaceous.

5. **Atriplex.** Fruiting bracts with margins often dilated and sides often muricate. Radicle from inferior to superior.

* * Bracts obcompressed, completely united, not muricate: testa membranous.

6. **Grayia.** Pericarp naked, very entire, orbicular, flattened, wing-margined. Radicle inferior. Flowers dicœcious. Shrubby, frequently spinescent, nearly glabrous.
7. **Suckleya.** Pericarp naked, subhastate, with crested margins and 2-toothed apex. Radicle superior. Flowers monœcious.
8. **Eurotia.** Pericarp conical, densely hairy, turgid, not winged, with a bifid apex. Radicle inferior. Flowers dicœcious. Low and shrubby, white-tomentose.

§ 3. Flowers perfect, without bracts: sepals 1 to 3, hyaline, marcescent: pericarp adherent to the vertical seed.

9. **Corispermum.** Fruit compressed-elliptic, acutely margined, not muricate. Flowers spicate. Low annual.

§ 4. Flowers mostly perfect, immersed by threes in the depressions of a close cylindrical spike: seeds vertical: fleshy saline plants, with jointed stems and scale-like leaves.

10. **Salicornia.** Flower-clusters decussately opposite. Perianth saccate, becoming spongy. Branches opposite.

§ 5. Embryo spiral (annular in all other sections): leaves fleshy, terete: stems not articulated.

11. **Sarcobatus.** Flowers unisexual; the staminate in aments, without perianth; the pistillate axillary, solitary, with saccate perianth. Fruit transversely winged. Saline shrub, somewhat spinescent.
12. **Suæda.** Flowers perfect, axillary. Perianth 5-cleft or -parted. Saline herbs, or woody at base.

1. KOCHIA, Roth.

Perianth subglobose. Stamens 5, usually exserted. Ovary depressed: styles 2, filiform. Pericarp membranous. — Woody at the base, with scattered linear terete leaves, and the flowers solitary or few in the axils of the virgate leafy stems.

1. **K. Americana,** Watson. Branching at base: stems villous-tomentose or nearly glabrous: flowers 1 to 3 in the axils, mostly with abortive stamens: perianth densely white-tomentose; lobes of the membranous wing cuneate-rounded, nerved and somewhat crenulate: ovary tomentose above. — Proc. Am. Acad. ix. 93. *K. prostrata* of American authors. W. Wyoming to N. W. Nevada and southward to Arizona.

2. CYCLOLOMA, Moquin. Winged Pigweed.

Calyx with concave lobes strongly keeled, enclosing the depressed fruit. Stamens 5. Styles 3.

1. **C. platyphyllum,** Moq. More or less arachnoid-pubescent; whole plant light green or often deep purple. — From Colorado to the head-waters of the Missouri and eastward to the Mississippi.

3. CHENOPODIUM, L. Goosefoot. Pigweed.

Lobes of the perianth usually somewhat keeled or crested, becoming dry, or rarely at length fleshy. Styles 2, rarely 3 or 4. Pericarp membranous, closely investing the seed. — Flowers, when in clusters, in interrupted spikes or panicled. Many are introduced weeds. Includes *Blitum,* Tourn., and *Teloxys,* Moquin.

§ 1. *Not pubescent or glandular, nor aromatic, sometimes somewhat mealy: fruiting calyx dry: seed lenticular, horizontal.*

* *Pericarp closely persistent: leaves more or less sinuate-dentate (except in No.* 1): *seed large* (¾ *line broad*).[1]

1. **C. olidum,** Watson. Farinose, *heavy-scented: leaves rather thick,* oblong to ovate, often slightly hastate, *entire:* flowers rather large, *in close clusters rather loosely panicled.* — Proc. Am. Acad. ix. 96. New Mexico and Arizona to Colorado and N. Utah.

2. **C. hybridum,** L. *Glabrous throughout* or only the inflorescence mealy, *rather stout and erect:* leaves thin, *somewhat triangular and heart-shaped,* taper-pointed, *sinuate-angled with* 2 *or* 3 *large teeth on each side: racemes diffusely and loosely panicled:* seed with acutish margin. — A very common weed everywhere, but apparently indigenous within our range in the mountains from New Mexico and Colorado to Washington Territory.

3. **C. glaucum,** L. *Glaucous-mealy, low and spreading;* upper surface of the leaves smooth: *leaves ovate to oblong-lanceolate, sinuate-dentate: flowers clustered in axillary spikes* shorter than the leaves: seed sharp-edged. — Proba-

[1] *C. album,* L., a species introduced everywhere, is mealy and pale, sometimes green, with leaves varying from rhombic-ovate to lanceolate, all or only the lower more or less angulate-toothed. It is usually known as "Pigweed" or "Lamb's Quarters."

bly indigenous in Colorado, and on the Saskatchewan; introduced in the Eastern States.

* * *Pericarp separating readily from the seed: leaves entire or hastately lobed: seed smaller.*

4. **C. Fremontii,** Watson. Erect, slender, more or less mealy: *leaves broadly triangular-hastate,* truncate or cuneate at base: flowers often small, white-mealy, *scattered in small clusters upon the slender open-panicled branchlets,* or sometimes more contracted. — Bot. King Exped. 287. New Mexico and Colorado, and westward to S. California.

Var. **incanum,** Watson. *Densely farinose,* low and *rather stout: flowers crowded in close contracted panicles.* — Proc. Am. Acad. ix. 94. Colorado and New Mexico.

5. **C. leptophyllum,** Nutt. Densely mealy or often nearly glabrous: *leaves linear, entire: flowers in small dense clusters in dense or interrupted spikelets.* — From the Sierras to Dakota and New Mexico; also along the Atlantic sea-coast.

Var. **subglabrum,** Watson. *Nearly glabrous,* loosely branched and panicled, *the clusters few-flowered and scattered on the branchlets.* — Proc. Am. Acad. ix. 95. Sandhills of the Platte.

Var. **oblongifolium,** Watson. Rather stout, *densely mealy: leaves oblong, often slightly hastate:* flowers in dense clusters in short close spikes. — Loc. cit. Colorado and New Mexico.

§ 2. *More or less glandular-puberulent, aromatic, not mealy: seed very small, not exceeding the dry perianth, horizontal.*

6. **C. cornutum,** Benth. & Hook. Diffusely branched: leaves thin, lanceolate, repand-dentate or coarsely sinuate-pinnatifid: flowers minute and solitary, axillary and terminal upon the repeatedly dichotomous nearly naked branches: calyx resinous-dotted. — *Teloxys cornuta,* Torr. From S. E. California to Arizona, Colorado, and Northern Mexico.

§ 3. *Glabrous: calyx becoming more or less fleshy in fruit and often colored: seed subglobose, mostly vertical: flowers in crowded clusters, axillary or in spikes.*

7. **C. rubrum,** L. *Stout, erect,* branching: *leaves triangular-hastate to lanceolate, cuneate at base, sparingly sinuate-dentate,* the upper narrowly lanceolate and entire: *flower-clusters densely spicate upon the leafy branchlets:* sepals 2 to 5, rather fleshy: stamens 1 or 2, or 5 in the terminal flowers. — *Blitum maritimum,* Nutt. *B. polymorphum,* C. A. Meyer. *B. rubrum,* Reich. From New Mexico northward, westward to California, and eastward.

Var. **humile,** Watson. *Smaller, prostrate or ascending: leaves ovate to lanceolate,* often hastate, *much smaller* (an inch long or less), *rarely toothed:* flowers in axillary or somewhat spicate clusters. — Bot. Calif. ii. 48. Colorado to Nevada and Washington Territory.

8. **C. capitatum,** Watson. Similar, but with *leaves more broadly triangular,* often somewhat hastate, *more acutely sinuate-toothed: flower-clusters large, in interrupted terminal naked spikes and solitary in the axils of the upper leaves:* calyx becoming fleshy in fruit, and the clusters red and berry-like. — Bot.

Calif. ii. 48. *Blitum capitatum*, L. From New Mexico to Washington Territory and the Saskatchewan, also eastward. Sometimes called "Strawberry Blite."

4. MONOLEPIS, Schrad.

Flowers polygamous. The single sepal becoming dry in fruit. Styles 2. Pericarp membranous, persistent upon the vertical flattened seed. — Low saline annuals, glabrous or somewhat mealy, with small alternate petioled fleshy leaves.

1. **M. chenopodioides,** Moq. Branched from the base: leaves lanceolate-hastate or sometimes narrowly spatulate, entire or sparingly sinuate-dentate, cuneate or attenuate at base; lower petioles elongated: flower-clusters often reddish: pericarp fleshy, becoming dry and minutely pitted. — From Arizona to N. E. California, the Saskatchewan, and Texas.

5. ATRIPLEX, Tourn.

Staminate flowers without bracts. The erect bracts of the pistillate flowers becoming enlarged and enclosing the fruit. Styles 2. Pericarp thin and membranous. — Herbs or shrubs, mealy or scurfy: leaves rarely opposite: flowers usually clustered, axillary or in simple or panicled spikes, the sexes distinct or mingled in the clusters. — *Obione*, Moquin. For satisfactory determination of the species well-matured fruiting bracts are necessary.

* *Annuals, somewhat succulent and mealy: leaves triangular-hastate, large: bracts nearly distinct, triangular or hastate, foliaceous-margined.*

1. **A. patula,** L. Dark green: leaves lanceolate-hastate, the lower ones opposite, entire or sparingly sinuate-toothed, petioled, the upper lanceolate to linear: flowers in naked and usually somewhat interrupted spikes, the lower clusters axillary: fruiting bracts ovate-triangular or rhombic-hastate, united at base, with a broad herbaceous entire or toothed margin. — Across the continent in salt or brackish localities. Very variable, the following varieties being the best defined within our range.

Var. **hastata,** Gray. The lower leaves at least broadly triangular-hastate, entire or toothed with shallow sinuses. — Ranging southward to Central Colorado.

Var. **subspicata,** Watson. A low form, usually quite scurfy: leaves lanceolate-hastate, ½ to 1 inch long. — Ranging farther north than the last, from the Missouri to the Saskatchewan.

* * *Annuals, not succulent, mealy or scurfy: leaves smaller: bracts more or less united, not triangular or hastate, nor greatly enlarged.*

+ *Bracts ovate, entire and not foliaceous nor appendaged.*

2. **A. Endolepis,** Watson. Leaves thin, lanceolate, sessile, entire: male flowers in short terminal and axillary spikes, lobes of the calyx with a fleshy crest upon the back; pistillate flowers solitary in the lower axils, sessile: bracts pubescent. — Proc. Am. Acad. ix. 110. Upper Missouri and head-waters of the Yellowstone.

+ + *Bracts small, ovate-oblong, truncate, usually few-toothed.*

3. **A. saccaria,** Watson. Low (3 to 5 inches high), diffusely branched, densely scurfy: *leaves subcordate-ovate,* very shortly petioled or sessile: flowers axillary: *bracts pedicelled* and often deflexed, *the truncate summit entire or suberose.* — Loc. cit. 112. S. Wyoming (*Dr. Gray*).

4. **A. Wolfii,** Watson. Low, branching, scurfy-canescent and reddish: *leaves linear, sessile:* flowers very small, in androgynous axillary clusters: *bracts sessile, 3-toothed.* — Loc. cit. Central Colorado (*Wolf*).

+ + + *Bracts orbicular, tooth-crested, with an acuminate foliaceous apex.*

5. **A. Powellii,** Watson. Erect, slender, grayish: leaves lanceolate, entire or subdenticulate: flowers androgynous, axillary: bracts with a broad terminal entire lobe, the margin below it gash-toothed, the sides doubly or triply tooth-crested. — Loc. cit. S. W. Colorado and Arizona.

+ + + + *Bracts rhombic-orbicular, indurated, usually conspicuously appendaged and the foliaceous margin toothed and undulate: leaves triangular and subhastate, the lower opposite.*

6. **A. argentea,** Nutt. *Diffusely branched* and leafy, grayish scurfy or nearly glabrous: *leaves petioled: male spikes short and dense:* bracts shortly-pedicelled. — *Obione argentea.* From Colorado to the Upper Missouri and N. E. California.

7. **A. expansa,** Watson. Like the last, but stouter, *more divaricately and distantly branched,* with thinner leaves, *sessile,* and *the male spikes elongated, slender* and leafless toward the apex. — Loc. cit. 116. S. Colorado and New Mexico to S. California.

* * * *Perennials, shrubby, densely appressed-scurfy.*

+ *Bracts with a toothed margin and the sides muricate.*

8. **A. Nuttallii,** Watson. Branching from the shrubby base: leaves oblong-spatulate to narrowly oblanceolate, entire: bracts ovate, strongly convex, united, the sides more or less crested. — Loc. cit. 116. *A. canescens,* Nutt. *Obione canescens,* Moq. From Colorado to N. Nevada and the Saskatchewan.

+ + *Bracts with free dilated entire margins, thick and scurfy, and the sides not muricate.*

9. **A. confertifolia,** Watson. Diffusely-branched, somewhat spinescent: leaves ovate to obovate, cuneate at base, entire: flower clusters small, axillary: bracts cuneate-orbicular, united at base. — Loc. cit. 119. *Obione confertifolia,* Torr. From S. Idaho and Wyoming to New Mexico and southward.

+ + + *Bracts connate and indurated, not scurfy or muricate, with 4 distinct broadly dilated wings.*

10. **A. canescens,** James. Leaves oblanceolate to narrowly oblong or linear, entire: flowers mostly dicœcious, in panicled spikes: the bracts forming a thick and indurated body, shortly pedicellate and with a narrow bifid apex, the broad wings somewhat decurrent upon the pedicel. — Watson, loc. cit. 120. From N. Nevada to Colorado, New Mexico, and S. California.

6. GRAYIA, Hook. & Arn.

Calyx mostly 4-parted. Bracts with a small naked orifice at the apex, net-veined. — Slightly scurfy or mealy undershrubs: leaves alternate, entire: flowers small, in axillary clusters or terminal spikes.

1. **G. polygaloides,** Hook. & Arn. Erect, 1 *to* 3 *feet high, the branches frequently spinescent: leaves glabrous* or at first with the young branches somewhat mealy, *oblanceolate or spatulate to obovate:* staminate flowers in axillary clusters; the pistillate mostly spicate: *fruiting bracts glabrous,* emarginate, white or pinkish, adherent below to the *pedicel of the ovary: styles slender, at first exserted.* — On alkaline soil eastward of the Sierras from the Columbia to Wyoming, Utah, and S. E. California.

2. **G. Brandegei,** Gray. *Lower and unarmed, more mealy: leaves linear-spatulate: fruiting bracts smaller, slightly mealy,* reuse at base, sometimes 3-winged; wings somewhat undulate; *ovary sessile, style short, included.* — Proc. Am. Acad. xi. 101. S. W. Colorado.

7. SUCKLEYA, Gray.

An annual, with branching prostrate stems, suborbicular leaves on long petioles, and flowers in axillary clusters.

1. **S. petiolaris,** Gray. Leaves acutely repand-dentate, pale green on both sides, nearly glabrous: bracts of the sessile fruit deltoid: male flowers tetramerous. — *Obione Suckleyana,* Torr. Near Denver (*Meehan*).

8. EUROTIA, Adamson.

Calyx 4-parted. Stamens with slender exserted filaments. Styles 2, somewhat hairy, exserted. — Stellately tomentose undershrubs: leaves entire: flowers in small axillary and somewhat spicate clusters.

1. **E. lanata,** Moq. White-tomentose throughout: leaves linear to narrowly lanceolate, with revolute margins: calyx-lobes hairy: fruiting bracts lanceolate, nearly covered by four dense spreading tufts of long silvery-white hairs, and beaked above with two short horns. — From New Mexico to Oregon and the Saskatchewan. Known as "White Sage" or "Winter Fat."

9. CORISPERMUM, Ant. Jussieu. Bug-seed.

Perianth usually of one sepal, erose or lacerate at the apex. Stamens 1 to 5, unequal. — Low, branching, pale green: leaves sessile, mostly narrow: flowers spicate, solitary in the axils of reduced bracts.

1. **C. hyssopifolium,** L. Somewhat floccose- or villous-pubescent, at least when young: leaves linear, cuspidate: spikes short and close, becoming more or less elongated: central stamen longest, the lateral ones partly developed or wanting. — From New Mexico to the Arctic regions, and from California to the Great Lakes.

10. SALICORNIA, Tourn. Glasswort. Samphire.

Calyx a fleshy rhomboidal sac with an anterior opening, adherent by a narrow line to the rhachis. Stamens 1 or 2, exserted in flower. Styles 2 or 3, short. — Low fleshy leafless saline plants, mostly herbaceous : spikes cylindrical.

1. **S. herbacea,** L. Erect or at length spreading, green : spike very thick and fleshy : scales obscure and very blunt, making a truncate barely emarginate termination of the joints of stem or elongated spike. — In salt marshes from Colorado and Utah to the Saskatchewan and along the Atlantic coast.

11. SARCOBATUS, Nees. Greasewood.

Flowers monœcious or diœcious, without bracts. Stamens 2 to 5, irregularly arranged under a stipitate peltate scale ; anthers fleshy. Perianth adherent at the contracted somewhat 2-lipped apex to the base of the stigmas, laterally margined by a narrow erect slightly 2-lobed border, which at length becomes a broad circular horizontal membranous veined wing. Style lateral, terminated by two thick exserted unequal stigmas. — A rigidly and divaricately branched shrub : leaves linear.

1. **S. vermiculatus,** Torr. Erect and scraggy, 2 to 8 feet high, leafy ; branches with a smooth white bark : staminate spikes terminal, the persistent scales spirally arranged, rhombic-ovate. — Common in the Great Basin, and to the Upper Missouri, head-waters of the Platte, and southward. The commonest of the several shrubs called "Greasewood."

12. SUÆDA, Forskal. Sea Blite.

Flowers minutely bracteolate. Lobes of the calyx unappendaged or more or less strongly keeled or crested, or at length somewhat winged. Testa shining, black, and crustaceous. — Flowers axillary along the branches, clustered or solitary, sessile.

* *Herbaceous annuals.*

1. **S. diffusa,** Watson. *Erect,* diffusely branching : *leaves subterete ; the floral ones similar* but shorter, usually rather distant on the branchlets : clusters 2 to 4-flowered : *calyx cleft to below the middle, not carinate or appendaged.* — Proc. Am. Acad. ix. 88. *S. maritima* of Bot. King Exped. From the Upper Missouri to California, Mexico, and Texas.

2. **S. depressa,** Watson. *Low and mostly decumbent,* branching from the base : *leaves linear,* broadest at base ; *the floral ones oblong- to ovate-lanceolate* or ovate, rather crowded on the branchlets : *calyx cleft to the middle, one or more of the lobes strongly carinate or crested.* — Bot. King Exped. 294. From Colorado to Nevada and the Saskatchewan.

Var. **erecta,** Watson. Erect, with very narrow leaves and narrower bracts. — Proc. Am. Acad. ix. 90. *S. maritima* of Fl. Colorado. Same range as the type, but extending into S. California.

* * *Woody-based perennials.*

3. **S. Torreyana,** Watson. Erect, with herbaceous leafy branches : leaves linear, subterete, the floral ones similar : calyx rather large, deeply cleft : seed finely tuberculate. — Loc. cit. 68. *S. fruticosa* of Bot. King Exped. From N. Colorado to Nevada, S. California, and Mexico.

Order 66. **POLYGONACEÆ.** (Buckwheat Family.)

Herbs, with alternate and entire leaves, or sometimes verticillate, and stipules in the form of sheaths above the swollen joints of the stem or none; flowers mostly perfect, with a more or less persistent calyx, a 1-celled ovary bearing 2 or 3 styles or stigmas, and a single erect seed; stamens mostly 4 to 9. Flowers rather small, the perianth of 3 to 6 segments, the inner ones or all usually petaloid; fruit an akene.

* Flowers involucrate: stamens 9: styles 3, with capitate stigmas: herbs or woody at base, with alternate or verticillate leaves, without stipules.

1. **Eriogonum.** Involucre several-flowered, with 4 to 8 pointless teeth. Flowers exserted. Akene mostly 3-angled. Annuals or perennials.
2. **Oxytheca.** Involucre few-flowered, herbaceous, with 3 to 5 straight acute or usually awned lobes. Flowers on exserted pedicels. Akene lenticular. Bracts ternate. Annuals.

* * Flowers without involucre: stamens 4 to 8: styles 2 or 3: herbs with alternate leaves and scarious sheathing stipules; juice usually acid, acrid or pungent.

3. **Oxyria.** Sepals 4, the outer smaller and spreading. Stigmas 2, tufted. Akene orbicular-winged. Leaves reniform.
4. **Rumex.** Sepals 6, the outer spreading, the inner enlarging and appressed to the triangular akene. Stigmas 3, tufted.
5. **Polygonum.** Sepals 4 to 6, equal, appressed to the triangular or lenticular akene. Styles 2 or 3: stigmas capitate.

1. ERIOGONUM, Michx.

Involucre campanulate, turbinate or oblong. Perianth 6-parted, colored, enclosing the akene. — Herbaceous or somewhat woody, with radical or alternate or verticillate leaves.

§ 1. *Involucres more or less broadly turbinate, not nerved or angled, 4 to 8-toothed or lobed: bracts foliaceous, rarely somewhat ternate.*

* *Akenes membranously winged.*

1. **E. alatum,** Torr. Loosely silky-villous throughout, or the leaves nearly glabrous except on the margin and midrib: leaves alternate, long, oblanceolate: involucres pedunculate, solitary, with 5 erect teeth: flowers a line long, yellow, nearly glabrous, abrupt at base: akene winged the whole length. — From Arizona and Texas to Nebraska.

* * *Akenes not winged.*

+ *Flowers glabrous.*

2. **E. umbellatum,** Torr. Tomentose: leaves glabrate above or glabrous, oblanceolate or spatulate: involucres deeply lobed; lobes becoming reflexed: *umbel simple, of 2 to 10 naked rays, on naked (rarely 1-bracted) peduncles.* — From Colorado to Oregon and California.

Var. **monocephalum,** Torr. & Gray. A reduced dwarf alpine form, the naked or bracteate peduncle bearing a solitary involucre: leaves small.

3. **E. heracleoides,** Nutt. Similar, but the *peduncle usually verticillate-bracted: leaves narrower, mostly somewhat revolute or undulate:* umbel 6- (1–11-)

rayed, *usually some or all of the rays once or twice divided.* — From Colorado to Nevada and Washington Territory.

+– +– *Flowers not glabrous.*

++ *Leafy: flowers not attenuate at base.*

4. **E. salsuginosum,** Hook. Low, glabrous, somewhat fleshy, di- or trichotomously divided: leaves spatulate-oblanceolate, the bracts becoming linear: involucres divided: flowers pubescent, yellow: sepals narrow, closely appressed to the acutely triangular glabrous akene. — From S. W. Colorado to Utah and W. Wyoming.

++ ++ *Naked or nearly so: flowers attenuate at base.*

= *Bracts conspicuous: akenes glabrous or nearly so.*

5. **E. Jamesii,** Benth. *Rather slender,* herbaceous, with branching caudex, *a foot high or less,* white-tomentose: *leaves and bracts oblong-oblanceolate,* the latter shortly petiolate: *involucres solitary, sessile,* with 5 erect teeth, *on a naked peduncle: flowers whitish, silky.* — Colorado, New Mexico, and Arizona.

Var. **flavescens,** Watson. *Stouter: flowers yellow or yellowish.* — Distinguished from the next by the strictly solitary sessile involucres.

6. **E. flavum,** Nutt. Tomentose throughout, *a span high or less: leaves oblanceolate: umbel of* 3 *to* 9 *rays, simple, on a naked peduncle: flowers yellow, very silky.* — Colorado to Washington Territory and the Saskatchewan.

7. **E. cæspitosum,** Nutt. *Dwarf, densely matted: leaves ovate- to oblong-spatulate, tomentose on both sides: involucres solitary on naked peduncles: flowers yellow, pubescent.* — From Wyoming to Nevada.

8. **E. sphærocephalum,** Dougl. Similar, but larger and *much more diffused: leaves linear-spatulate,* often revolute: *peduncles with a whorl of oblanceolate bracts* sometimes subtending a 2 to 4-rayed umbel, the lateral rays also bracteate: *flowers yellow, pubescent.* — Nevada and California to Washington Territory, and extending thence eastward into Montana.

= = *Bracts small: akenes densely villous.*

9. **E. acaule,** Nutt. *Very dwarf and densely matted* and tomentose: *leaves crowded,* oblong: *peduncles naked,* ½ *inch high, bearing a head of* 1 *to* 5 *nearly sessile involucres: flowers pubescent.* — S. W. Colorado to S. Idaho.

10. **E. lachnogynum,** Torr. *Cespitose* and densely tomentose: leaves oblong-lanceolate: *the slender naked peduncle a foot high, sparingly dichotomous above: involucres solitary,* sessile or long pedunculate: *flowers densely tomentose.* — S. Colorado and New Mexico.

§ 2 *Involucres campanulate or short-turbinate, not nerved or angled, with* 5 *rounded erect teeth, pedunculate in diffuse repeatedly di- or trichotomous panicles: bracts not foliaceous, all ternate: flowers not attenuate at base: ovary glabrous.*

* *Leaves tomentose.*

+– *Stems simple, leafy, naked above.*

11. **E. annuum,** Nutt. Tall and stout: leaves narrowly oblanceolate or oblong, attenuate to a short petiole, mostly flat: inflorescence cymose: involucres densely white-tomentose: flowers white: sepals very unequal, the outer oblong-obovate. — Colorado to Texas and Mexico.

+– +– *Branching: leaves radical or at least the peduncles leafless.*

+– +– *Densely white-tomentose.*

12. **E. tenellum,** Torr. Tall: branches of the woody caudex short and crowded or elongated: leaves ovate or rounded, tomentose on both sides: inflorescence rather sparingly branched, glabrous: flowers white or pinkish: outer sepals broadly obovate or orbicular, the inner linear-oblong. — S. Colorado to Texas and Mexico.

+– +– *Glabrous: involucres turbinate-campanulate.*

13. **E. cernuum,** Nutt. *Leaves broadly ovate, acute: pedicels deflexed:* outer sepals oblong or broader above, *retuse.* — New Mexico and Colorado to Oregon.

14. **E. reniforme,** Torr. Low and slender: *leaves reniform or cordate-orbicular,* densely white-tomentose on both sides: bracts smooth, *the margins ciliate: pedicels long and filiform, rarely deflexed,* all in the forks or terminating the branches: *flowers rose-colored,* glabrous. — S. W. Colorado to S. California.

15. **E. Thomasii,** Torr. Low and very slender: *leaves rounded and ovate, small: bracts minute, glabrous:* pedicels as in the last: *flowers yellowish,* often reddish, slightly hispid or glabrous: outer sepals often much dilated below. — S. W. Colorado to S. California.

* * *Leaves not tomentose.*

+– *Leaves all radical or nearly so.*

16. **E. inflatum,** Torr. Glabrous, diffusely branching, *the stem and internodes often inflated: leaves rounded, usually cordate* and mostly undulate, *pubescent: flowers yellowish, pubescent.* — S. W. Colorado to Arizona, Nevada, and S. California.

17. **E. Gordoni,** Benth. A similar species, but *glabrous throughout,* or the petioles slightly pubescent: *flowers glabrous, light rose-color.* — Colorado.

18. **E. glandulosum,** Nutt. *Beset with short-stipitate glands: leaves small, obovate, somewhat villous:* involucres glabrous: *flowers slightly hispid.* — Collected by Dr. Gambel in Colorado or New Mexico.

+– +– *Leaves developed at the nodes in the axils of ordinary triangular bracts.*

19. **E. divaricatum,** Nutt. Low, grayish-pubescent, branching from the base, branches terete: leaves thickish, all rounded or the upper oblong, petiolulate: involucres very small and few-flowered: flowers whitish, minutely glandular: sepals nearly equal. — W. Wyoming to S. W. Colorado.

§ 3. *Involucres cylindric-turbinate, more or less strongly 5 to 6-nerved, and often becoming costate or angled, with as many short erect teeth, sessile in heads or clusters, or scattered in cymes or along virgate panicled branches: bracts ternate, connate at base, more or less rigid: flowers not attenuate at base.*

* *Outer sepals broad and somewhat cordate, the inner much narrower: ovary scabrous above.*

20. **E. ovalifolium,** Nutt. Low, densely tomentose and cespitose, with a short closely branched caudex: leaves round or rarely oblong: bracts very small: involucres in a single close head: flowers rose-colored, white, or yellow: outer sepals oblong, becoming orbicular, the inner spatulate, often retuse. — From Colorado to N. California and British America.

* * *Sepals similar and nearly equal: akenes smooth or nearly so.*

+– *Involucres capitate, heads solitary: dwarf and cespitose, alpine or subalpine, densely white-tomentose.*

21. **E. pauciflorum,** Nutt. Caudex short-branched: tomentose throughout, or the *linear-oblanceolate revolute leaves glabrous above: involucres broadly turbinate, nearly glabrous, thin, with broad somewhat scarious teeth: flowers white, glabrous.* — Colorado.

22. **E. chrysocephalum,** Gray. Caudex more diffusely branched, woody: tomentose throughout, the *narrowly oblanceolate leaves sometimes glabrate above: involucres narrower and rather more firm, shortly toothed, somewhat tomentose: flowers yellow, glabrous.* — Proc. Am. Acad. xi. 101. Wahsatch Mountains.

23. **E. multiceps,** Nees. Rather diffusely branched at base, densely white-tomentose throughout: leaves narrowly oblanceolate: *involucres rigid, narrowly turbinate, with very short teeth: flowers rose-colored, pubescent.* — Nebraska to Colorado.

+– +– *Involucres mostly solitary, in a repeatedly di- or trichotomous corymb-like cyme.*

24. **E. microthecum,** Nutt. Low and rather slender, *woody and diffusely much-branched,* leafy below, more less white-tomentose: leaves usually narrow, revolute, becoming glabrate above: *involucres often pedunculate:* inner sepals emarginate. — From Nebraska to New Mexico, the Sierra Nevada, and Oregon.

Var. **effusum,** Torr. & Gray. With very diffuse and repeatedly divided inflorescence. — More common eastward.

25. **E. corymbosum,** Benth. *Stouter and more rigid, usually densely tomentose: leaves broader and less revolute:* umbel stiff and broadly cymose: *involucres mostly sessile.* — Including *E. microthecum,* var. *Fendlerianum,* Benth. Same range as last.

26. **E. brevicaule,** Nutt. *Less woody and more shortly branched at base, glabrous or glabrate above the white-tomentose base:* leaves linear to narrowly oblanceolate, attenuate to a very short petiole, often revolute, sometimes glabrate above: flowers yellow. — Idaho and Wyoming to New Mexico.

+– +– +– *Involucre sessile and solitary upon the few strict branches of the once or twice forked panicle.*

27. **E. racemosum,** Nutt. White-tomentose, sparingly or not at all branched at base, stout, 1 to 3 feet high: leaves large, ovate to oblong, on long petioles: lower bracts somewhat foliaceous: involucres approximate, tomentose: flowers white or rose-colored. — S. W. Colorado to Utah and New Mexico.

2. OXYTHECA, Nutt.

Flowers, bracteoles, etc., as in *Eriogonum.* — Slender diffusely branched (repeatedly dichotomous) annuals, the slender internodes more or less covered with small stipitate glands: leaves rosulate at the base: segments of the glandular-pubescent perianth similar and equal.

1. **O. dendroidea,** Nutt. A foot high or less, the scape-like stem

usually 1 or 2 inches high: leaves linear-oblanceolate, hirsute: bracts unequal: involucres in the forks on slender pedicels, the rest more nearly sessile: flowers light rose-color. — From Wyoming to Nevada.

3. OXYRIA, Hill. Mountain Sorrel.

Flowers perfect. The two inner sepals erect, appressed, and unchanged in fruit. Stamens 6. — Perennial alpine and arctic herbs, erect, with long-petioled round-reniform mostly radical leaves, and small obliquely truncate sheaths: flowers small and greenish, in narrowly panicled racemes.

1. **O. digyna,** Campdera. Rather stout and fleshy, 3 to 18 inches high, glabrous: flowers in scarious-bracted fascicles, on short capillary pedicels: sepals often reddish, the outer narrower and carinate. — At high altitudes in cold wet places among rocks throughout the northern hemisphere.

4. RUMEX, L. Dock. Sorrel.

Flowers perfect, polygamous, or diœcious. Inner sepals somewhat colored and becoming reticulated (*valves*) in fruit. Stamens 6. — Coarse perennial herbs: stems leafy, with obliquely truncate cylindrical naked sheaths: flowers small, fascicled or verticillate in paniculate racemes.

§ 1. *Flowers perfect or polygamous: valves enlarged, often bearing a grain-like callosity on the back: leaves never hastate, pinnately many-veined, rarely very acid.* — Docks.

* *Valves wholly without grains, mostly very large* (3 *lines long or more*), *entire or denticulate: pedicels long, jointed near the base: glabrous.*

1. **R. venosus,** Pursh. Stems erect, *a foot high or less,* from running rootstocks, *stout and leafy,* with conspicuous dilated stipules: leaves on short but rather slender petioles, ovate or oblong to lanceolate, 3 *to* 6 *inches long, only the lowest acute or somewhat cordate at base: panicle nearly sessile, short, dense in fruit: valves entire,* cordate-orbicular *with a deep sinus,* 9 *to* 12 *lines in diameter,* bright rose-color. — From Colorado and Nevada to British Columbia and the Saskatchewan.

2. **R. occidentalis,** Watson. *Tall and rather slender, often* 3 *to* 6 *feet high:* leaves oblong-lanceolate, the lowest sometimes ovate, *usually narrowing gradually upward from the truncate somewhat cordate base,* not decurrent on the slender often elongated petiole, *often a foot long or more: panicle narrow, elongated, nearly leafless:* valves broadly cordate, *with a very shallow sinus,* 3 *lines in diameter, often denticulate near the base.* — Proc. Amer. Acad. xii. 253. *R. longifolius* of authors, not of DC. From New Mexico and Colorado to Labrador and Alaska.

* * *Valves smaller, one or more of them grain-bearing.*

3. **R. salicifolius,** Weinman. Slender, often low, 1 to 5 feet high, usually branching and decumbent at base, *glabrous:* leaves narrowly or linear-lanceolate, or the lowest oblong, 3 to 6 inches long, *attenuate into a short petiole, not undulate,* glaucous: *panicle usually open,* the flowers crowded upon the branches: *valves ovate-rhomboidal to broadly deltoid, entire or denticulate,* usually with very large callosities. — Across the continent and northward to Alaska.

4. **R. maritimus,** L. Simple or diffusely branched, the low stems erect or procumbent, *minutely pubescent:* leaves linear lanceolate, *usually truncate or cordate at base,* 1 to 4 inches long, mostly on short petioles, *somewhat wavy-margined: flowers in numerous dense verticils* along the slender branches: *valves ovate-lanceolate, with* 2 *or* 3 *long-awned teeth on each side, all grain-bearing.* — From the Sierra Nevada eastward across the continent.

§ 2. *Flowers diœcious or polygamous in naked panicles: valves not grain-bearing: leaves often hastate, sparingly veined: stems erect and slender, glabrous.*[1]

5. **R. paucifolius,** Nutt. Roots thickened: leaves narrowly to linear-lanceolate, or the lowest broader, attenuate to a slender petiole, not very acid: flowers reddish, in loose fascicles; pedicels filiform, jointed at base: valves enlarged in fruit, cordate-ovate, entire, twice longer than the akene. — From Utah and Montana to the Sierra Nevada and Washington Territory.

5. POLYGONUM, L. Knotweed.

Flowers perfect. — Annual or perennial leafy herbs, rarely woody at base: sheaths naked, ciliate, or foliaceous-margined: flowers small, in axillary, spicate, or racemose fascicles.

§ 1. *Flowers in axillary fascicles or spicate with foliaceous bracts: leaves and bracts jointed upon a very short petiole adnate to the naked* 2*-lobed or lacerate sheath: perianth* 5 *to* 6*-parted, more or less herbaceous, close-appressed to the akene: stamens* 3 *to* 8, *the three inner filaments broad at base: styles* 3: *akene triangular.* — Avicularia.

* *Flowers in the axils of leaves or in loose virgate spikes: sepals herbaceous or colored only on the margin.*

+ *Branches leafy to the summit: sheaths short and mostly scarious, at length lacerate.*[2]

1. **P. erectum,** L. *Rather stout, erect or ascending, glabrous, usually tinged with yellow:* leaves oblong or oval: *flowers often yellowish,* on more or less exserted pedicels: sepals and stamens 5, rarely 6: akene very broadly ovate to lanceolate, *dull and granular to nearly smooth and shining.* — From Colorado to Nevada and Oregon and the Eastern States.

2. **P. minimum,** Watson. *Very low and slender, ascending,* rarely 6 inches high, *usually more or less scabrous-puberulent:* stems nearly terete, *reddish:* leaves ovate to oblong, sometimes all narrowly lanceolate: flowers in all the axils, usually small, erect on slender exserted pedicels, *often tinged with rose-color:* stamens 5 to 8: *akene smooth and shining.* — Bot. King Exped. 315. *P. Torreyi,* Watson, Am. Nat. vii. 664. From the Wahsatch and Uintas to California and Oregon.

[1] *R. Acetosella,* L., is the common "Sorrel" of fields and gardens, spread everywhere from Europe. It can be distinguished from *R. pauciflorus* by its slender running roots, more hastate and very acid leaves with the lobes often toothed at base, pedicels very short and jointed at the top, and the valves not enlarged nor exceeding the small akene.

[2] *P. aviculare,* L., may be known by its prostrate or spreading habit, sessile lanceolate or oblong leaves, dull broadly ovate akene which is minutely granular under a lens. — Introduced from Europe and growing everywhere about yards and roadsides. Variously called "Knot-grass," "Goose-grass," or "Door-weed."

+ + *Branches slender and virgate, angled, terminating in more or less open spikes, the narrow leaves diminishing upward and becoming bract-like.*

3. **P. ramosissimum,** Michx. Erect or ascending, *usually* 2 *to* 4 *feet high,* often branching only above, *glabrous, the whole plant yellowish: sheaths loose, becoming lacerate to the base:* leaves lanceolate to linear: flowers and fruit as in *P. erectum,* the sepals more frequently 6, *stamens* 3 *to* 6, and akene usually smooth and shining. — From the Sierra Nevada eastward across the continent.

4. **P. tenue,** Michx. Erect and slender, ½ *to* 1½ *feet high, glabrous and somewhat glaucous, sometimes slightly scabrous at the nodes: sheaths with a close somewhat herbaceous base, sparingly scarious and lacerate above:* leaves linear to lanceolate, usually much reduced above: *flowers often solitary and usually distant,* soon reflexed, the sepals margined with white or rose-color: *stamens* 8: akenes ovate, black and shining. — From Arizona to British Columbia and eastward across the continent. The following varieties occur in the Rocky Mountains: —

Var. **latifolium,** Engelm. With broader leaves and more numerous flowers.

Var. **microspermum,** Engelm. A low slender form, with minute flowers and fruit.

* * *Low and slender: flowers in short dense spikes, with imbricated bracts: sepals colored: leaves linear.*

5. **P. imbricatum,** Nutt. Stem 1 to 8 inches high, smooth or slightly scabrous at the nodes, often diffusely branched: sheaths rather large, 2-parted or lacerate above the short scarious base: bracts with sometimes a scarious margin: flowers nearly sessile, rose-colored or white: stamens 3 or 5: akene minutely tuberculate-striate or smoothish. — Alpine and subalpine, from Colorado to California and Oregon. It has usually been referred to *P. coarctatum.*

§ 2. *Flowers fascicled, in usually dense spikes, with small scarious bracts: leaves not jointed on the petiole: sheaths cylindrical and truncate, scarious, entire, naked or ciliate-fringed or margined: perianth colored, 5-parted, appressed to the lenticular or triangular akene: stamens* 4 *to* 8; *filaments filiform.* — PERSICARIA.

* *Sheaths and bracts not ciliate nor fringed: sepals not punctate: style* 2-*cleft, and akene flattened or lenticular.*

6. **P. Pennsylvanicum,** L. *Stem* 1 *to* 3 *feet high,* smooth below, *the branches above and especially the peduncles beset with bristly-stalked glands:* leaves lanceolate, roughish on the midrib and margins: *spikes oblong, obtuse, erect, thick:* flowers bright rose-color: *stamens mostly* 8, *somewhat exserted.* — Colorado and eastward to the Atlantic States.

7. **P. incarnatum,** Ell. *Stem* 3 *to* 6 *feet high, nearly glabrous,* the peduncles, etc. often minutely rough with scattered sessile glands: leaves rough on the margins and midrib, elongated-lanceolate: *spikes linear, nodding, becoming slender: flowers smaller than in the last,* lighter rose-color shading to white: *stamens* 6 *and styles* 2, *both included.* — Colorado and eastward to the Atlantic States.

8 **P. lapathifolium,** Ait., var. **incanum,** Koch. *Lower,* with shorter and less pointed leaves, *which are lanceolate, obtuse, and white-downy beneath:*

sheaths often somewhat hairy or ciliolate: *spikes shorter, oblong and blunt.* — In the Wahsatch, on the Saskatchewan, and eastward to New York. Rare.

9. **P. nodosum,** Pers. *Often stout,* 1 *to* 4 *feet high, branching, mostly glabrous,* often sparingly and minutely glandular on the peduncles: leaves rather narrowly lanceolate, *cuneate at base and shortly petioled,* somewhat scabrous with short prickly hairs on the midrib and margins: *spikes axillary and terminal, oblong and erect or often linear and nodding:* flowers white or light rose-color: *stamens* 6 *and styles* 2, *included.* — Colorado and New Mexico to Arizona, California, and Oregon.

10. **P. amphibium,** L. *Aquatic, stout and glabrous* or nearly so, not branching above the rooting base: *leaves floating, thick, smooth and shining above, usually long-petioled, elliptical to lanceolate,* cuneate or cordate at base: sheaths leaf-bearing at about the middle: *spike terminal, dense, ovate or oblong,* ½ *to* 1 *inch long,* on a usually short peduncle: *flowers bright rose-color: the* 5 *stamens and* 2-*cleft style exserted.* — From the Sierra Nevada eastward across the continent. In shallow water or on muddy banks the stems become erect, the petioles shorter, and the whole plant more strigose-pubescent.

11. **P. Muhlenbergii,** Watson. *In muddy or dry places, scabrous with short appressed or glandular hairs,* especially upon the leaves and upper part of the simple stem: *leaves thinner* and longer, rather broadly lanceolate, narrowly acuminate, usually rounded or cordate at base: *spikes more elongated,* 3 *inches long,* often in pairs: flowers and fruit nearly as in the last. — *P. amphibium,* var. *terrestre,* of Gray's Manual. Across the continent.

* * *Sheaths and bracts bristly ciliate or the sheaths sometimes foliaceously margined.*

12. **P. Hartwrightii,** Gray. *Closely allied to the two preceding species,* growing usually in the mud, the ascending stems rooting at the base and very leafy, *more or less rough hairy,* at least on the sheaths and bracts: leaves rather narrow, on very short petioles, *not punctate,* adnate to the middle of the sheath: *flowers bright rose-color: sepals not glandular-dotted: style* 2-*cleft, and akene somewhat flattened.* — Proc. Am. Acad. viii. 294. From California and Utah eastward through the Northern States.

13. **P. Hydropiper,** L. *Smooth,* 1 to 2 feet high, *juice very acrid: leaves punctate:* spikes nodding, usually short or interrupted: *flowers mostly greenish: sepals conspicuously dotted: stamens* 6: *style* 2 *to* 3-*parted:* akene dull, minutely striate, *either flat or obtusely triangular.* — Ranging across the continent northward, where it is probably indigenous.

§ 3. *Glabrous alpine or subalpine herbs, with thick creeping rootstocks and simple stems: flowers in dense spike-like racemes: leaves not jointed on the petiole: sheaths obliquely truncate, naked, as well as the scarious ovate or lanceolate bracts: perianth colored, deeply* 5-*cleft, at length appressed to the triangular akene: stamens* 8, *with filiform filaments: styles* 3, *long.* — BISTORTA.

14. **P. Bistorta,** L. *Stems a foot or two high:* leaves few, the radical ones on long petioles, oblong-lanceolate to linear, acute at each end, the cauline much reduced, mostly obtuse at base and sessile upon the sheath, the margin often slightly revolute: flowers rose-colored to white, *on slender pedicels, in very dense ovate to oblong spikes and usually long-peduuculate:* stamens

and styles exserted: akene smooth and shining. — Throughout the northern hemisphere; frequent in meadows and on stream-banks in the mountains. The leaves vary much, from cordate and oblong (var. *oblongifolium*, Meisn.) to very narrow and attenuate at base (var. *lincarifolium*, Watson).

15. **P. viviparum,** L. A similar species, but *mostly dwarf* and more exclusively alpine: *flowers smaller, nearly sessile in linear spikes* 1 to 3 inches long, *at least the lower ones replaced by sessile bulblets a line long.* — Same range as the last.

§ 4. *Herbs with fibrous roots, mostly twining or climbing, and with cordate or sagittate leaves: flowers in loose panicles or racemes or in terminal or axillary clusters: perianth green with colored margins, 5-parted, enlarging or keeled in fruit: stamens mostly* 8: *stiles or stigmas* 3.[1] — TINARIA.

16. **P. dumetorum,** L., var. **scandens,** Gray. Smooth, twining high over bushes, with cordate or slightly halberd-shaped acute leaves, and flowers in slender axillary sparingly leafy racemes: perianth long-attenuate to the slender reflexed pedicel; the outer sepals strongly winged upon the keel: akene acutely triangular. — From the Atlantic States to the Upper Missouri, Colorado, and Washington Territory.

ORDER 67. ELÆAGNACEÆ.

Shrubs, the foliage scurfy throughout with scarious silvery or brown scales, with regular flowers perfect or dicœcious, the perianth herbaceous or colored within, its tube lined with a prominent disk bearing the stamens, enclosing the 1-celled ovary, and becoming pulpy or spongy without and bony within; fruit a membranous akene, closely covered by the drupe-like calyx-tube. Flowers solitary or variously clustered in the axils of the branchlets.

1. **Elæagnus.** Flowers perfect. Stamens 4. Leaves alternate.
2. **Shepherdia.** Flowers dicœcious. Stamens 8. Leaves opposite.

1. ELÆAGNUS, L.

Calyx-limb cylindric-campanulate or tubular below, parted above into 4 deciduous lobes, colored within. Disk glandulose. Stamens adnate to the calyx and alternate with its lobes. Fruit drupe-like, with an oblong, 8-striate stone. — Leaves entire and petioled, and flowers axillary and pedicellate.

1. **E. argentea,** Pursh. A stoloniferous unarmed shrub, 6 to 12 feet high, the younger branches covered with ferruginous scales: leaves broad or narrowly elliptic, silvery-scurfy and more or less ferruginous: flowers numer-

[1] *P. Convolvulus*, L., is low twining or procumbent and minutely scabrous, leaves halberd-cordate acuminate, flowers few in axillary fascicles or small interrupted racemes on very short pedicels, outer sepals sharply keeled. — Introduced from Europe, very common in the Eastern States, and found in Colorado and Montana.

ous, deflexed, silvery without, pale yellow within, fragrant, the tube broadly oval, the limb funnelform: fruit globose-ovoid, dry and mealy, edible. — From Utah to the Upper Missouri and eastward to Minnesota and Canada.

2. SHEPHERDIA, Nutt. Buffalo-Berry.

Staminate perianth 4-parted, the lobes spreading. Stamens alternate with as many lobes of a thick disk; filaments free. Pistillate flowers with oblong-tubular perianth; limb 4-cleft, erect, the throat closed by the lobes of the disk. Fruit berry-like, with a smooth shining compressed seed. — Flowers small (the staminate larger), shortly pedicellate.

1. **S. argentea,** Nutt. Somewhat spiny shrub, 5 to 18 feet high: *leaves silvery on both sides, mostly oblong,* obtuse, cuneate at base: *fruit a smooth ovoid scarlet berry, acid and edible,* nearly sessile. — East of the Sierra Nevada to the Saskatchewan, and southward in the mountains to New Mexico.

2. **S. Canadensis,** Nutt. Shrub 3 to 6 feet high, *the branchlets, young leaves, yellowish flowers, etc., covered with rusty scales: leaves elliptical or ovate, nearly naked and green above,* silvery downy as well as scurfy with rusty scales beneath: *fruit yellowish-red, insipid.* — From the Columbia River eastward across the continent, and in the mountains southward to New Mexico.

Order 68. LORANTHACEÆ.

Evergreens, parasitic on shrubs or trees, dull yellowish-green or brownish, with dichotomous branches and swollen joints, the opposite thick and coriaceous exstipulate and entire leaves reduced to mostly connate scales: flowers dicœcious, of 2 to 5 sepals coherent at base: anthers as many as the sepals and inserted upon them: ovary inferior, 1-celled: fruit a berry with glutinous endocarp. — Flowers small and inconspicuous, greenish.

1. **Phoradendron.** Flowers globose, mostly 3-lobed. Anthers 2-celled, opening by 2 pores or slits: pollen-grains smooth. Berry globose, pulpy and semi-transparent.
2. **Arceuthobium.** Flowers mostly compressed; the staminate usually 3-parted, the pistillate 2-toothed. Anthers a single orbicular cell, opening by a circular slit; pollen spinulose. Berry compressed, fleshy.

1. PHORADENDRON, Nutt. Mistletoe.

Flowers immersed in the rhachis of jointed spikes. — Parasitic on branches of various kinds of trees: spikes single or in pairs in the axils of opposite leaves, the lowest joint sterile, the others bearing solitary or several flowers on each side. Flowering in February or March, and maturing its fruit the next winter.

1. **P. juniperinum,** Engelm. Glabrous, stout, densely branched, 6 to 9 inches high: branches terete, the ultimate branchlets quadrangular: scales broadly triangular connate or distinct, ciliate: staminate spikes of a single

6 to 8-flowered joint: pistillate spikes 2-flowered: berry whitish or light red. — Pl. Fendl. 58. On different species of *Juniperus*. S. W. Colorado to New Mexico, Arizona, Nevada, and California.

2. ARCEUTHOBIUM, Bieb.

Flowers axillary or terminal, solitary or several from the same axil. — Parasitic on Conifers, glabrous, with rectangular branches and connate scale-like leaves: flowers often crowded into apparent spikes or panicles, opening in summer or autumn and maturing their fruit in the second autumn, when the berries suddenly and forcibly eject the glutinous seed to the distance of several yards.

* *Staminate flowers all (or nearly all) terminal on distinct peduncle-like joints, paniculate.*

1. **A. Americanum,** Nutt. Slender, dichotomously or verticillately much branched, greenish yellow: staminate plants sometimes 3 or 4 inches long, fertile plants much smaller. — On *Pinus contorta*. From Wyoming to Oregon and southward to Colorado and California.

* * *Staminate flowers axillary (with a terminal one), forming simple or compound spikes. Ours are greenish-brown, with the accessory branchlets of fruiting specimens mostly leaf-bearing.*

2. **A. divaricatum,** Engelm. Rather stout, 2 to 4 inches high, and a line in diameter at base, olive-green or pale brownish: *branches spreading, often flexuous or recurved: staminate flowers few and scattered or in* 3 *to* 7*-flowered spikes*, with ovate acute lobes. — Pl. Wheeler, 1874, 16. On *Pinus edulis* and *P. monophylla*, from New Mexico and S. Colorado to Arizona and S. Utah.

3. **A. robustum,** Engelm *Stouter and not so spreading: spikes much denser*, the buds of the staminate flowers flat and appressed, and the 3-parted flowers with shorter and broader lobes. — On *Pinus ponderosa*. Arizona and northward in the Rocky Mountains.

Order 69. SANTALACEÆ.

Herbs or shrubs, usually root-parasitic, with angled or striate branches, entire alternate and mostly sessile leaves without stipules, and mostly perfect flowers with 3 to 5-cleft perianth adherent to the 1-celled 2 to 4-ovuled ovary, which becomes an indehiscent 1-seeded usually nut-like fruit; stamens 3 to 5, opposite the perianth lobes, at the edge of an epigynous often lobed disk; style 2 to 5-lobed.

1. COMANDRA, Nutt. Bastard Toad-Flax.

The campanulate or urn-shaped perianth with a 5-lobed persistent limb. Disk with a free lobed margin. Stamens included: anthers attached by tufts of hairs to the base of the calyx-lobes. — Low herbaceous smooth perennials, with subterranean rootstocks: leaves glaucous, the lowest scale-like: flowers greenish white, in small terminal or axillary umbellate clusters.

1. **C. umbellata,** Nutt. Stems leafy, 6 to 15 inches high: *leaves oblong:* umbels few-flowered, corymbosely clustered at the summit of the stem: flowers on slender pedicels, the white oblong erect or slightly spreading lobes about equalling the green tube, which is continued conspicuously above the ovary: *fruit globular, 2 or 3 lines in diameter.* — In the Sierra Nevada of California northward to Washington Territory and eastward across the continent.

2. **C. pallida,** A. DC. Differing from the last in its *narrower more glaucous and acuter leaves, which are linear to narrowly lanceolate* (or those upon the main stem oblong), all acute or somewhat cuspidate: *fruit ovoid, larger* (3 to 4 lines long), sessile or on short stout pedicels. — New Mexico and Colorado to Oregon.

Order 70. **EUPHORBIACEÆ.** (Spurge Family.)

Herbs (ours), with milky acrid juice, monœcious or diœcious commonly apetalous and often naked flowers, a free and usually 3-celled ovary with (in ours) one pendulous ovule in each cell, and maturing into a 3-celled elastically dehiscent capsule with crustaceous seeds. Stamens one to many. Styles or stigmas as many or twice as many as the cells of the ovary. Leaves mostly alternate and simple, often stipulate.

* Staminate and pistillate flowers both with a perianth, without an involucre.

+ Stamens erect in the bud.

1. **Tragia.** Petals none. Calyx 3 to 8-parted. Flowers in racemes, terminal or opposite the leaves, pistillate at the base. Stamens 2 or 3. Style 3-parted.
2. **Argythamnia.** Petals and sepals 5. Flowers in axillary spicate clusters, pistillate below. Stamens 5 to 15 in 1 to 3 whorls. Styles bifid.

+ + Stamens incurved in the bud.

3. **Croton.** Flowers in terminal spike-like racemes. Erect and gray-scurfy.

* * Flowers all without perianth, included in a cup-shaped calyx-like involucre.

4. **Euphorbia.** Pistillate flower solitary, soon exserted: the staminate numerous, each of a single stamen.

1. TRAGIA, Plumier.

Staminate calyx 3 to 5-parted. Filaments short: anther-cells united. Pistillate calyx 3 to 8-parted, persistent. Pod 3-lobed, bristly, separating into three 2-valved carpels. — Erect or climbing plants, pubescent or hispid, sometimes stinging, with mostly alternate stipulate leaves: the sterile flowers above, the few fertile at the base, all with small bracts.

1. **T. nepetæfolia,** Müller, var. **ramosa,** Müller. Hirsute, erect, much branched, 6 to 8 inches high: stem slender, at length flagelliform-elongated, weak and somewhat turning: leaves triangular-ovate from a cordate base or oftener lanceolate, gradually acuminate. — Colorado and southward.

2. ARGYTHAMNIA, P. Browne.

Calyx valvate in the staminate flowers, imbricate in the pistillate. Petals alternate with the calyx-lobes and with the lobes of the glandular disk.

Filaments united into a central column. Seeds subglobose, roughened or reticulated, not carunculate. — Erect herbs or undershrubs, with purplish juice: leaves alternate, usually stipulate, entire (in ours).

1. **A. humilis,** Müll. Stem about one foot high, much branched, silky or strigose-pubescent, branches spreading: leaves narrowed at the base, spatulate or obovate-lanceolate or linear-lanceolate, acute, sparingly pubescent: raceme much shorter than the leaves, on very short peduncles. — S. Colorado and southward.

3. CROTON, L.

Staminate calyx 4 to 6-parted. Petals often present, but small or rudimentary, alternating with the glands of a central disk. Stamens 5 to many, on a hairy receptacle. Pistillate calyx usually 5-parted, but the petals mostly obsolete. Seeds smooth and shining, carunculate. — Herbs or shrubs, scurfy or stellately hairy or sometimes glandular: leaves alternate, entire or repand.

1. **C. Texensis,** Müll. Covered with a close canescent stellate pubescence, dichotomously branched or spreading, 1 to 2 feet high: leaves lance-ovate, oblong, or linear-lanceolate: dicœcious; racemes of staminate flowers short: ovary stellate-tomentose; styles twice or thrice dichotomously 2-parted. — S. Colorado and southward.

4. EUPHORBIA, L.

Flowers monœcious, included in 4 to 5-lobed involucres, the lobes usually alternating with as many fleshy glands which are rounded or often petaloid-margined or crescent-shaped. — Mostly herbs: leaves opposite or alternate or the upper ones verticillate: involucres terminal or in the forks, the sterile flowers lining the base and each from the axil of a little bract, the fertile flower solitary in the middle of the involucre, soon protruded on a long pedicel.

A. *Glands of the involucre with petal-like, usually white or rose-colored, entire or toothed margins or appendages.*

§ 1. *Leaves all similar, opposite, on short petioles, small, oblique at base, furnished with awl-shaped or scaly and often fringed stipules: stems much branched, spreading or usually procumbent: involucres solitary in the forks of the branches or in terminal or lateral clusters, small, with 4 glands.*

* *Seeds smooth and even: leaves entire, glabrous.*

1. **E. petaloidea,** Engelm. Glabrous: stems procumbent or ascending: leaves attenuate to the scarcely oblique base, oblong-linear or linear, retuse or emarginate: involucres solitary, campanulate, lobes hairy beneath the glands within, the broadly campanulate appendages conspicuous; peduncles longer than petioles: seeds reddish, with rounded angles. — From Colorado to Nebraska and eastward to the Mississippi.

2. **E. flagelliformis,** Engelm. Distinguished from the last by the smaller involucre bearing very small and almost naked glands, often less than

four in number; the more numerous stamens (often 25) with much smaller anthers; and by the smaller, more angular and more pointed, grayish seeds. — Brandegee, Fl. S. W. Colorado, 243. S. W. Colorado to the Rio Grande.

* * *Seeds minutely roughened or transversely wrinkled, or pitted.*

+ *Leaves entire.*

3. **E. lata,** Engelm. *Canescent with appressed pubescence:* stems from a woody rootstock, spreading, short, rigid; lower internodes longer than the leaves, uppermost very short: *leaves triangular-ovate,* abruptly attenuate at base, or oblong with revolute margins; *stipules triangular-lanceolate: involucre axillary, solitary,* campanulate, hairy, *lobes elongated;* glands ovate with a very narrow lobulate appendage: *capsule hirsute: seed oblong, transversely wrinkled.* — S. E. Colorado and southward.

4. **E. Fendleri,** Torr. & Gray. *Glabrous,* from a slender rootstock: stems delicately filiform, erect or decumbent: *leaves ovate from a rounded base; stipules subulate, often laciniate at base: involucres terminal, solitary,* turbinate, slightly bearded in the throat, *lobes short;* glands transversely oblong with a very narrow obsolete appendage: *seed ovate, 4-angled, irregularly punctate.* — S. Colorado and southward.

5. **E. revoluta,** Engelm. *Glabrous:* stem erect, filiform, naked below, much branched above the middle: *leaves narrowly linear,* revolute on the margins, attenuated below; *stipules subulate, entire: involucres very small, uppermost in the forks of the branches and terminal,* short-campanulate; glands purple, with a whitish or reddish oblong appendage: *capsule glabrous: seed oblong, sharply 4-angled, sparingly and irregularly rugose.* — Colorado and southward.

+ + *Leaves serrate or serrulate: flowers in lateral leafy clusters.*

6. **E. stictospora,** Engelm. Prostrate and *pubescent: leaves rounded, subcordate, sharply serrate:* racemes crowded, with very small and slender long-peduncled involucres: capsule sharp angled, pubescent: *seeds slender, sharply 4-angled, rugose-dotted.* — Bot. Mex. Bound. 187. Abundant in New Mexico and extending into S. Colorado.

7. **E. serpyllifolia,** Pers. Prostrate-spreading and *glabrous: leaves obovate-oblong, narrowed at the very oblique base, sharply serrulate toward the apex:* glands of the involucre with narrow somewhat toothed appendages: *seeds acutely 4-angled, slightly cross-wrinkled and often pitted.* — From California and the Columbia River to the Saskatchewan, Iowa, and Texas.

8. **E. glyptosperma,** Engelm. Erect-spreading and *glabrous: leaves linear-oblong, mostly falcate, very unequal at base* (semicordate), *sharply serrulate:* glands of the very small involucre with narrow crenulate appendages: *seeds sharply 4-angled and with 5 or 6 sharp transverse wrinkles.* — From Illinois and Wisconsin to Colorado and the Columbia River.

9. **E. maculata,** L. Prostrate and *puberulent or hairy: leaves oblong-linear, very oblique at base, serrulate upwards, usually with a brown-red spot in the centre:* glands of the small involucre minute, with narrow slightly crenate (usually red) appendages: *seeds ovate, sharply 4-angled and with about 4 shallow grooves across the concave sides.* — Colorado, and common eastward.

§ 2. *Leaves opposite, on short petioles, equal at base, with stipular glands: stems dichotomously branched, erect: cymes terminal, involucres with 5 glands: seeds tuberculate.*

10. **E. hexagona,** Nutt. Somewhat hairy: stem a foot or more high; branches striate-angled: leaves linear-lanceolate, entire: involucre hairy without and within: glands with a green ovate-triangular appendage twice their length: capsule smooth: seeds ovate. — From Texas and Colorado to the Upper Missouri.

§ 3. *Uppermost or floral leaves with conspicuous white petal-like margins, whorled or opposite, the others scattered, equal at base, entire and sessile: involucres 5-lobed, collected in an umbel-like inflorescence.*

11. **E. marginata,** Pursh. Stem stout (2 to 3 feet high), erect, hairy: leaves ovate or oblong: umbel with 3 dichotomous rays: glands of the involucre with broad white appendages. — From Colorado to Kansas and Nebraska. Cultivated and run wild in the Eastern States.

B. *Glands of the involucre without petaloid appendages.*

§ 4. *Involucres in terminal clusters, 4 to 5-lobed, with few cup-shaped glands: seed without a caruncle: leaves dentate, all but the lowest opposite, and stipules glandular.*

12. **E. dentata,** Michx. Erect or ascending, hairy: leaves ovate, lanceolate, or linear, petioled, coarsely toothed, upper ones often paler at the base: involucres almost sessile, with 5 oblong dentate lobes, and one or more short-stalked glands: seeds ovate-globular, slightly tubercled. — S. Colorado (*Brandegee*) and eastward to Illinois and Pennsylvania.

§ 5. *Involucres in a terminal dichotomous or commonly umbelliferous inflorescence, 4 or 5-lobed, with as many flat or convex entire or crescent-shaped glands: seeds mostly carunculate: glabrous, with entire or serrulate scattered (except the uppermost) leaves and no stipules.*

13. **E. obtusata,** Pursh. Erect: *leaves* oblong-spatulate, *minutely serrulate,* smooth, obtuse; upper ones cordate at base; floral ones ovate, dilated: umbel once or twice divided into 3 rays, then into 2: involucre with naked lobes and *small stipitate glands: styles* distinct and *longer than the ovary, erect,* 2-cleft to the middle: *pod beset with long warts: seeds smooth and even.* — S. Colorado, and from Illinois to Virginia.

14. **E. dictyosperma,** Fisch. & Meyer. Erect: *leaves* oblong- or ovate-spatulate, smooth, obtuse and *obtusely serrate;* upper ones cordate at base: umbels once or twice 3-forked, then 2-forked; involucre with nearly naked lobes and *small almost sessile glands: styles shorter than the ovary, spreading or recurved: pod warty: seeds delicately reticulated.* — From California and Oregon to Texas, Kentucky, and Nebraska.

15. **E. montana,** Engelm. Very glabrous and *glaucous:* stems leafy and ascending: *leaves rather thick, entire,* ovate, obtuse; floral ones orbiculate, triangular: umbels repeatedly dichotomous: involucre roughish within, with oblong-linear *velvety lobes,* and truncate, very shortly 2-horned glands: *styles very short,* bifid: *pod smooth: seeds superficially pitted.* — From the Upper Platte to New Mexico, Arizona, and southward.

Order 71. CALLITRICHACEÆ. (Water-Starworts.)

Small slender aquatic herbs, with opposite entire leaves, no stipules and monœcious axillary flowers without perianth, but sometimes with 2 bracts; stamen 1, with slender filament and heart-shaped 4-celled anther; ovary 4-celled, with 2 styles; fruit 4-lobed, flattened and emarginate. Flowers mostly solitary, sometimes a male and female in the same axil

1. CALLITRICHE, L.

Characters given under the order.

1. **C. verna,** L. *Amphibious,* with elongated stems and *floating rosulate obovate often emarginate leaves, the submerged ones from spatulate to linear: bracts often exceeding the fruit,* rarely wanting: styles erect or spreading, deciduous: fruit orbicular or obcordate or elliptical, *of connate carpels.* — From California and Oregon to Montana and Wyoming, and eastward across the continent.

2. **C. autumnalis,** L. *Submersed, with numerous uniform linear one-nerved leaves, truncate or retuse at the apex: flowers without bracts:* styles reflexed, caducous: fruit round, *deeply notched,* the margins thin or at length winged. — From California northward, and thence eastward across the continent.

Order 72. CERATOPHYLLACEÆ. (Hornwort Family.)

Aquatic herbs, with whorled finely dissected leaves, and minute axillary and sessile monœcious flowers without floral envelopes, but with an 8 to 12-cleft involucre in place of a caly the fertile a simple 1-celled ovary.

1. CERATOPHYLLUM, L.

Sterile flowers of 12 to 24 stamens, with sessile anthers. Fruit an achenium, beaked with a slender persistent style. — Submersed plants, in ponds or slow-flowing streams: the sessile leaves cut into thrice-forked threadlike divisions.

1. **C. demersum,** L. Stems very slender, a foot or two long: leaves in numerous whorls of 6 to 8: akene elliptical, shortly stipitate, with a short spine or tubercle on each side near the base. — California and northward, thence eastward across the continent.

Order 73. URTICACEÆ.

Plants generally with stipules, and monœcious or dicœcious, or rarely perfect flowers, furnished with a regular calyx, free from the 1-celled ovary which forms a 1-seeded fruit; stamens as many as the lobes of the calyx and opposite them, or sometimes fewer.

Suborder I. **ULMACEÆ.** (Elm Family.)

Flowers perfect or monœciously polygamous. Filaments straight or moderately incurved in the bud. Styles or stigmas 2. Fruit a samara or drupe. — Trees, with alternate leaves.

1. **Ulmus.** Flowers sometimes perfect. Ovary 2-ovuled. Fruit a samara. Anthers extrorse.
2. **Celtis.** Flowers polygamous. Ovary 1-ovuled. Fruit a drupe. Anthers introrse.

Suborder II. **URTICEÆ.** (Nettle Family.)

Flowers monœcious or diœcious. Filaments wrinkled and inflexed in the bud. Style or stigma simple. Ovary always 1-celled and 1-seeded, becoming an akene. — Herbs with a tough fibrous bark and opposite or alternate leaves.

* Calyx in the fertile flowers of 2 to 5 separate or nearly separate sepals: plant beset with stinging bristles.

3. **Urtica.** Sepals 4 in both sterile and fertile flowers. Akene straight and erect, enclosed by the 2 inner and larger sepals. Stigma capitate-tufted. Leaves opposite.
4. **Laportea.** Sepals 5 in the sterile flowers, 4 in the fertile, or apparently only 2, the two exterior being minute. Akene very oblique and bent down, nearly naked. Stigma long and awl-shaped. Leaves alternate.

* * Calyx of the fertile flowers tubular or cup-shaped, enclosing the akene. Plant wholly destitute of stinging bristles.

5. **Parietaria.** Flowers polygamous, in involucrate-bracted clusters. Stigma tufted. Leaves alternate.

Suborder III. **CANNABINEÆ.** (Hemp Family.)

Flowers diœcious; the sterile racemed or panicled; the fertile in clusters or catkins. Filaments short, not inflexed in the bud. Fertile calyx of one sepal, embracing the ovary. Stigmas 2, elongated. Ovary 1-celled, 1-ovuled, becoming a glandular akene. — Herbs with opposite lobed leaves and a fibrous inner bark.

6. **Humulus.** Fertile flowers in a short spike forming a membranaceous catkin in fruit. Anthers erect. Leaves 3 to 5-lobed.

1. ULMUS, L. Elm.

Calyx bell-shaped, 4 to 9-cleft. Stamens 4 to 9, with long slender filaments. Ovary 2-celled. Fruit winged all around. — Flowers polygamous, purplish or yellowish, in lateral clusters, preceding the leaves, which are strongly straight-veined, short-petioled, and oblique or unequally somewhat heart-shaped at base.

1. **U. Americana,** (L.) Willd. Buds and branchlets glabrous: branches not corky: leaves obovate-oblong or oval, abruptly pointed, sharply and often doubly serrate, soft pubescent beneath or soon glabrous, smooth above or nearly so: flowers on slender drooping peduncles which are jointed above the middle, in close fascicles: fruit glabrous except the margins, its sharp points

incurved and closing the notch. — In the Atlantic States, and extending within our boundary through Minnesota. Known as "American" or "White Elm."

2. CELTIS, Tourn. Hackberry.

Calyx 5 to 6-parted. Stamens 5 to 6. Ovary 1-celled. Fruit globular. — Leaves pointed, petioled: flowers greenish, axillary, the fertile solitary or in pairs, peduncled, appearing with the leaves; the lower usually staminate only, in little fascicles or racemose along the base of the branches of the season.

1. **C. occidentalis,** L. Leaves reticulated, ovate, cordate-ovate and ovate-lanceolate, taper-pointed, sharply serrate, sometimes sparingly so or only towards the apex, scabrous but mostly glabrous above, usually soft-pubescent beneath, at least when young: fruit reddish or yellowish, becoming dark purple. — From Colorado to Wisconsin and eastward. A small or middle-sized tree with the aspect of an elm.

3. URTICA, Tourn. Nettle.

Flowers clustered, the clusters mostly in racemes, spikes, or loose heads. Stamens in the fertile flowers inserted around the cup-shaped rudiment of a pistil. — Flowers greenish. Ours are perennials with flower clusters in panicles or panicled spikes.[1]

1. **U. gracilis,** Ait. *Sparingly bristly, slender:* leaves ovate-lanceolate, *serrate,* 3 to 5-nerved from the rounded or scarcely heart-shaped base, *almost glabrous, the elongated slender petioles sparingly bristly: spikes slender and loosely panicled.* — Colorado and northward, thence eastward across the continent.

2. **U. Breweri,** Watson. *Tall and stout, grayish with a short somewhat hispid pubescence,* or nearly glabrous, and with scattered bristles: *leaves thin, finely pubescent,* soon glabrate or roughish above, ovate to oblong-lanceolate, rounded or slightly cordate at base, *coarsely serrate, on slender petioles: flowers in short open panicles scarcely exceeding the petioles.* — Proc. Amer. Acad. x. 348. Ranging from S. California to S. Colorado and Texas.

3. **U. holosericea,** Nutt. *Tall and stout,* more or less bristly, *finely and densely tomentose especially on the lower side of the leaves: leaves thick,* oblong-to ovate-lanceolate, rounded at base, *on short stout petioles: staminate flowers in loose slender diffuse panicles nearly equalling the leaves;* pistillate panicles denser and shorter. — *U. dioica,* var. *occidentalis,* Watson, Bot. King Exped. Abundant in the Wahsatch and westward throughout California.

4. LAPORTEA, Gaudichaud. Wood-Nettle.

Flowers clustered in loose cymes; the upper widely spreading and chiefly or entirely fertile; the lower mostly sterile. — Herbs with large alternate serrate leaves, and axillary stipules.

[1] *U. dioica,* L., is very bristly and stinging, with leaves ovate, heart-shaped, very deeply serrate, downy underneath, and the spikes much branched. — Introduced into Colorado and elsewhere from the East, where it has come from Europe.

1. **L. Canadensis,** Gaudichaud. Leaves ovate, pointed, strongly feather-veined, long-petioled; stipule single, 2-cleft. — Throughout the Atlantic States, and coming within our borders at the northwest.

5. PARIETARIA, Tourn. PELLITORY.

The staminate, pistillate, and perfect flowers intermixed in the same involucrate-bracted cymose axillary clusters. — Diffuse or tufted herbs, with entire 3-ribbed leaves and no stipules.

1. **P. Pennsylvanica,** Muhl. Low, simple or sparingly branched, minutely downy: leaves oblong-lanceolate, thin, veiny, roughish with opaque dots: flowers shorter than the leaves of the involucre. — From Colorado to Nevada and eastward across the continent.

6. HUMULUS, L. HOP.

Sterile flowers with 5 sepals and 5 erect stamens. Fertile flowers in short spikes with leafy imbricated bracts, each 2-flowered. Akene invested with the enlarged scale-like calyx. — Twining rough perennials, with stems almost prickly downwards, mostly opposite heart-shaped and palmately 3 to 7-lobed leaves.

1. **H. Lupulus,** L. Leaves commonly longer than the petioles: the fruiting calyx, akene, etc., sprinkled with yellow resinous grains, giving the bitterness and aroma of the hop. — In the mountains from New Mexico to British America and eastward across the continent.

ORDER 74. CUPULIFERÆ. (OAK FAMILY.)

Trees or shrubs, with alternate and simple straight-veined leaves, deciduous stipules, and monœcious flowers, both kinds of flowers in catkins, or the fertile solitary, clustered, or spiked, the 1-celled, 1-seeded nut with or without an involucre.

Tribe I. Both kinds of flowers in scaly catkins, 2 or 3 under each bract, and no involucre to the naked often winged small nut. — BETULEÆ.

1. **Betula.** Stamens 2, with bifurcate filaments and separate anther-cells. Bracts 3-lobed, becoming coriaceous and caducous. Nutlet broadly winged.
2. **Alnus.** Stamens 4: anther-cells contiguous. Bracts entire, becoming woody, persistent. Nutlet not winged.

Tribe II. Sterile flowers destitute of a true calyx, consisting of several stamens included under and more or less adnate to a bract: filaments short; anthers 1-celled. Fertile flowers in a scaly bud or catkin, two under each fertile bract, each with one or more bractlets, which form a foliaceous involucre to the nut. — CORYLEÆ.

3. **Corylus.** Bract of staminate flower furnished with a pair of bractlets inside. Involucre leafy-coriaceous, enclosing the large bony nut.

Tribe III. Sterile flowers with a distinct 4 to 7-lobed calyx, including 3 to 20 stamens: filaments exserted; anthers 2-celled. Fertile flowers one or few enclosed in a cupule consisting of bracts variously consolidated. — QUERCINEÆ.

4. **Quercus.** Sterile flowers in slender catkins. Cupule 1-flowered, scaly and entire; nut hard and terete.

1. BETULA, Tourn. Birch.

Sterile flowers 3, and bractlets 2, under each shield-shaped scale or bract of the catkins, consisting each of a calyx of one scale bearing 2 two-parted filaments. Fertile flowers without bractlets or calyx. — Outer bark usually separable in sheets, that of the branchlets dotted. Twigs and leaves often spicy-aromatic.

1. **B. occidentalis,** Hook. *Becoming* 10 *or* 20 *feet high,* with close dark-colored bark (at length light brown); branches more or less resinous-dotted at the extremities: *leaves thin, broadly ovate, acute,* truncate or rounded or somewhat cuneate at base, *with short glandular-tipped serratures* and often obscurely lobed, somewhat resinous above, smooth or slightly appressed-villous beneath: *the divaricately* 3*-lobed bracts pubescent ciliate: wings of the nutlet as broad as the body or broader.* — From California to Washington Territory and the Saskatchewan, and in the Rocky Mountains to New Mexico. Sometimes called "Black Birch."

2. **B. glandulosa,** Michx. *A low bush,* 4 *to* 6 *feet high* or less, the dark-colored branches usually more or less resinous-glandular: *leaves small, obovate to oblong-obovate,* mostly cuneate at base, *rounded and crenate above,* smooth and often resinous-coated: *the deeply* 3*-lobed bracts slightly ciliate: seed orbicular-winged.* — From California to Sitka, and eastward through British America to the Atlantic, and southward in the mountains to New Mexico.

2. ALNUS, Tourn. Alder.

Sterile flowers 3, and bractlets 4 or 5 under each short-stalked shield-shaped scale, consisting each of a 3 to 5-parted calyx and as many stamens, with the filaments short and simple. Fertile flowers with a calyx of 4 little scales adherent to the scales or bracts of the catkin.

§ 1. *Flowers developed in spring with the leaves; the sterile from catkins which have remained naked over winter; while the fertile have been enclosed in a scaly bud: fruit with a conspicuous thin wing.*

1. **A. viridis,** DC. Shrub 3 to 8 feet high: leaves round-oval, ovate, or slightly heart-shaped, glutinous and smooth or softly downy underneath, serrate with very sharp and closely set teeth, on young shoots often cut-toothed: fertile catkins slender-stalked, clustered, ovoid. — Mountains of Colorado and northward into British America, and thence eastward to N. New York and New England.

§ 2. *Flowers developed in earliest spring, before the leaves, from mostly clustered catkins which (both sorts) were formed the foregoing summer and have remained naked over winter: fruit wingless or with a narrow coriaceous margin.*

2. **A. incana,** Willd. Shrub or small tree 8 to 20 feet high: leaves broadly oval or ovate, rounded at the base, sharply serrate, often coarsely toothed, *whitened and mostly downy underneath:* fruit orbicular. — From Colorado northward and thence eastward.

Var. **virescens,** Watson. Leaves acutely double-toothed, *light green and glabrous on both sides* or sparingly pubescent: nutlets round-obovate, thinly

margined. — Bot. Calif. ii. 81. Ranges eastward with the species, but extends westward to the S. Sierra Nevada and Oregon.

3. CORYLUS, Tourn. Hazel-nut.

Sterile flowers in drooping cylindrical catkins. — Shrubs with doubly-toothed leaves, flowering in early spring: sterile catkins single or fascicled from scaly buds of the axils of the preceding year, the fertile terminating early leafy shoots.

1. **C. rostrata,** Ait. Shrub 2 to 5 feet high: leaves ovate or ovate-oblong, somewhat heart-shaped, pointed: involucre of united bracts, much prolonged above the ovoid nut into a narrow tubular beak, densely bristly. — From Colorado to Washington Territory, thence northward and eastward to the Alleghanies.

4. QUERCUS, L. Oak.

Sterile flowers in naked catkins. Fertile flowers scattered or somewhat clustered. — Flowers greenish or yellowish: sterile catkins single or often several from the same lateral scaly bud: flowering in the spring and shedding the nuts in the fall. — Our two species are "White Oaks," being annual-fruited and having sweet kernels.

1. **Q. macrocarpa,** Michx. Leaves obovate or oblong, lyrately-pinnatifid or deeply sinuate-lobed, or nearly parted, downy or pale beneath; the lobes sparingly and obtusely toothed, or the smaller ones entire: *cup deep, conspicuously imbricated with hard and thick-pointed scales, the upper ones awned, so as usually to make a mossy fringed border: acorn half immersed in or entirely enclosed by the cup.* — Throughout the Atlantic States and coming within our range at its northeastern limit. North of the Missouri River a low scrubby form is found, which has been called var. *depressa,* Engelm., having also smaller leaves and much smaller acorns than the species.

2. **Q. undulata,** Torr. Leaves from lyrate to nearly entire, always downy below: the sweet and edible acorns oval, oblong, or sometimes elongated: the subhemispherical, sessile, short- or sometimes long-peduncled cup varies from scaly to very knobby. — Ann. Lyc. N. Y. ii. 248, t. 4; Engelm. in Trans. St. Louis Acad. iii. 382, 392. An exceedingly variable species, embracing, as now understood, all the Rocky Mountain forms. These forms can be arranged in two groups as follows: —

* *Leaves larger, strongly lobed, darker green, and decidedly deciduous: calyx-lobes narrower, ciliate: acorns often thicker and shorter.* — From W. Texas through Colorado to Utah and Arizona.

Var. **Gambelii,** Engelm. The large leaf with broader emarginate or even lobed divisions. — *Q. Gambelii,* Nutt.

Var. **Gunnisoni,** Engelm. Lobes of the leaf narrow and entire. — *Q. alba,* var. *Gunnisoni,* Torr.

Var. **breviloba,** Engelm. Leaves sinuate or broad- and short-lobed. — *Q. obtusiloba,* var. *breviloba,* Torr.

Var. **Jamesii,** Engelm. Like var. *Gunnisoni,* but the smaller and more rigid leaves with acute lobes.

* * *Leaves smaller, paler, more rigid, mostly spinous-dentate, and (at least southward) more or less persistent: calyx-lobes broader and woolly: acorns often slender and longer.* — Ranging farther north and east than the other group.

Var. **Wrightii,** Engelm. Leaves small (an inch long or less), sinuate-dentate, the teeth very rigid and pungent. — The *Q. Emoryi* of Fl. Colorado, with which Arizona species it has been constantly confounded.

Var. **grandifolia,** Engelm. Leaves very large (3 to 5 inches long), nearly entire or undulate: peduncles very long. — Upon the Upper Arkansas (*Brandegee*) and Arizona.

ORDER 75. SALICINEÆ. (WILLOW FAMILY.)

Dicœcious trees or shrubs, with both kinds of flowers in catkins, one under each bract, entirely destitute of floral envelopes; the fruit a 1-celled and 2-valved pod, with numerous seeds furnished with long silky down. — Leaves alternate, undivided.

1. **Salix.** Bracts entire. Flowers with small glands; disks none. Stamens few. Stigmas short. Buds with a single scale.
2. **Populus.** Bracts lacerate. Flowers with a broad or cup-shaped disk. Stamens numerous. Stigmas elongated. Buds scaly.

1. SALIX, Tourn. WILLOW. OSIER. (By M. S. BEBB, Esq.)

Aments preceding or accompanying the leaves. Filaments filiform, free or more or less connate. Ovary and capsule more or less conical. — Trees, shrubs, or undershrubs, mostly confined to the neighborhood of water: leaves mostly long and pointed, feather-veined.

§ 1. *Aments on short lateral leafy branchlets: scales yellowish, falling before the capsules mature: filaments hairy below: shrubs and small trees of the lowlands.*

* *Stamens* 3 *to* 5: *capsules glabrous: leaves lanceolate, serrate.*

1. **S. amygdaloides,** Anders. Leaves lanceolate or ovate-lanceolate, 2 to 4 inches long, ½ to 1 inch wide, attenuate-cuspidate, paler or glaucous beneath, closely and sharply serrate; *petioles slender eglandular;* stipules minute and very early deciduous: *staminate aments elongated, slenderly-cylindrical,* 2 to 3 inches long, subflexuose, the flowers somewhat remotely and subverticillately arranged on the slender rhachis; *fertile* becoming *very loose in fruit,* 3 to 4 inches long: scales in male aments ovate, villous with crisp hairs, in the female narrower, smoother, and fugaceous: capsules lanceolate, on slender pedicels; style very short or obsolete, stigmas notched. — A small tree, growing on the banks of streams, from New York and Missouri west to Oregon. The nearly allied *S. nigra,* so common between the Gulf of Mexico and the Great Lakes, has not been found within our limits.

2. **S. lasiandra,** Benth., var. **Fendleriana,** Bebb. *Leaves* lanceolate, tapering to a very long attenuate point, *coriaceous,* scarcely paler beneath,

closely glandular-serrate; stipules small, roundish; *petioles glandular at the tip: staminate aments densely flowered, oblong-cylindrical,* 1 to 2 inches long, obtuse; *fertile* rather shorter, erect or spreading, *in fruit thick;* scales dentate, hairy at base, in the female ament almost glabrous: stamens 5 or more: capsules tapering from an ovate base: style short; stigmas bifid. — Banks of mountain streams, frequent. Scarcely distinguished from *S. lucida* of the Eastern States by the narrower and less glossy leaves.

* * *Stamens* 2: *capsules tomentose or glabrous: leaves linear, remotely mucronate-dentate.*

3. **S. longifolia,** Muhl. Leaves varying from linear to lanceolate, long acuminate, tapering at base, sessile or nearly so, 2 to 4 inches long, 1 to 6 lines (usually 2 to 3 lines) wide, margin remotely denticulate with projecting teeth or sometimes entire; stipules very early deciduous: aments linear-cylindrical, often clustered at the extremity of the branchlets: scales villous, dentate, subdeciduous: capsules oblong-conical, obtuse, shortly pedicelled, tomentose or glabrous: stigmas large, sessile. — From Maine and Maryland across the continent to Oregon and California. Exceedingly variable in foliage, flowers, and fruit. A shrub (within our limits) rooting extensively in alluvial deposits and forming dense clumps.

§ 2. *Aments lateral or terminal with or without bracts: scales persistent, usually darker at the tip: stamens* 2; *filaments glabrous.*

* *Capsules glabrous.*

4. **S. cordata,** Muhl. *Leaves linear- or oblong-lanceolate,* acuminate, *glandular-serrate,* glabrous (usually more or less silky when young); those of vigorous barren shoots broadly-lanceolate, rounded or subcordate at base, 3 to 4 inches long, 1 to 1½ inches wide, rigid, paler and reticulate-veined beneath, coarsely serrate, conspicuous stipules ovate or reniform; those of depauperate growths linear-lanceolate, taper-pointed at both ends, 2 inches long by ¼ inch wide, very finely and closely serrate, scarcely paler beneath, stipules minute: aments more or less bracted, cylindrical, 1 to 3 inches long in fruit: scales dark at the tip, clothed with long white hairs: *capsule* lanceolate, glabrous, green or reddish, *long pedicelled:* style medium; stigmas notched.

Var. **Mackenziana,** Hook. Leaves obovate-lanceolate, narrowed at base, subentire; stipules small: aments shortly peduncled; pedicels long and slender, much exceeding the small, sparsely villous tawny scale.

Var. **vestita,** Anders. Recent twigs tomentose; young leaves silky: aments thick, closely sessile, preceding the leaves: scales clothed with long silky hairs.

Northern States clear across the continent and northward to the Arctic coast. The var. *vestita,* growing on the banks of the Missouri and Yellowstone Rivers, *L. F. Ward,* known as "Diamond Willow" from the peculiar arrest of wood-growth at the base of the atrophied twigs, is said to afford very durable timber. It is altogether incredible, however, that any form of *S. cordata* ever attains tree-like size.

5. **S. Novæ-Angliæ,** Anders. *Leaves obovate-oblong or oval,* somewhat obtuse, *closely crenate, green and glabrous both sides, young drying black,* adult rigid, striate-nerved, *shining; stipules small or none:* aments short, oval-oblong,

at first wrapped in the leaves of the short peduncle: scales obovate-roundish, apex black, villous with white hairs: capsules conic-rostrate glabrous, green or reddish, short-pedicelled: style medium; stigmas thick, entire, erect.

Var. **pseudo-myrsinites.** Small shrub 1 to 3 feet high, divaricately branched: leaves 1½ inches long, ½ inch wide, short petioled, *membranaceous: prominently nerved* aments leafy-bracted, 1½ inches long.

Var. **pseudo-cordata,** Anders. By no means a tall shrub, branches upright: leaves oval-oblong, 1½ inches long, ½ inch wide, scarcely narrower below the middle, roundish at base, apex produced, rather acute, margin minutely serrulate: aments about an inch long.

Rocky Mountains of Colorado and Montana (valley of Nevada Creek, *Canby*), and northward to the Saskatchewan and Mackenzie Rivers.

6. **S. irrorata,** Anders. *Leaves linear-lanceolate,* 3 to 4 inches long, ½ inch or less wide, very smooth, somewhat coriaceous, bright green and shining above except the yellowish midrib, paler or *often intensely glaucous beneath, remotely undulate-serrate;* petioles ¼ inch long; buds large, roundish; *stipules evanescent: aments all appearing before the leaves,* an inch long, crowded on the branches, *sessile,* scarcely bracted, *very densely flowered;* males oblong, golden-yellow; females erect or spreading, at length 1 to 1½ inches long: scales dark, obtuse, villous: capsules ovate-conical, smooth, green, scarcely pedicelled: style medium; stigmas very short, entire or bifid. — Shrub 6 to 8 feet high, with upright branches. One-year-old twigs often covered with a beautiful glaucous bloom, which is easily rubbed off; not present on vigorous young shoots. Mountains near Golden, *Greene;* Manitou, *Brandegee, Jones;* Empire City, *Engelmann.* Only the very young leaves (an inch long) accompanying the flowers and fruit of Fendler's No. 812 were known to Professor Andersson.

7. **S. monticola,** Bebb. *Leaves oblong-lanceolate, the earliest obovate,* acute, 3 to 6 inches long, 1 to 1¾ inches wide, glabrous, rigid and glaucous beneath or thin and pale beneath, unevenly crenate or serrulate; *stipules large,* semicordate, acute; *buds large, ovate and beaked at the tip: aments thick,* densely flowered, *sessile;* males closely so; females with a few broad bracts at base, when in flower about an inch long, lengthening in fruit to 1½ or 2 inches: scales oval, obtuse, clothed wtih long yellowish-white silky hairs: capsules ovate-conical, glabrous, sessile or nearly so: style elongated; stigmas erect, bifid or entire. — Marshy places along streams, mountains of Colorado: Golden, *Greene;* Georgetown, *Patterson;* Empire City, *Engelmann.* Also collected in fragmentary specimens, mostly old fruiting aments, by Hall and many other subsequent explorers: probably common. A densely cespitose shrub, 8 to 12 feet high, stem 1 to 2 inches in diameter. The broad, irregularly-toothed leaves (especially when rigid and glaucous beneath) bear a remarkable resemblance to those of *S. discolor;* a resemblance heightened by the conspicuous stipules on vigorous shoots; but the aments are very different. Allied to the foregoing and more nearly representing the European *S. daphnoides, S. irrorata* being the equivalent as it were of *S. acutifolia.*

* * *Capsules tomentose* (*rarely glabrate in* 12 *and* 13).

+ *Pedicels slender, style obsolete or none.*

8. **S. flavescens,** Nutt. *Leaves obovate* or oblanceolate, acute or the lower obtuse, *wedge-shaped at base,* 2 to 3 inches long, 1 to 1½ inches wide,

downy but very soon glabrate and dull green above, glaucous and rufous pubescent beneath or often when young clothed with a lustrous silky tomentum; margin entire or irregularly subserrate; stipules small, denticulate, fugaceous: *aments* oblong, densely flowered, *appearing before the leaves*, the males closely sessile, an inch long, the females on distinct peduncles, rarely with leafy bracts, in fruit 2 inches long or more: *scales blackish*, obovate, very silky: capsules white-tomentose, 3 to 4 lines long, tapering into a long beak, the *slender pedicels about equalling the scales:* styles obsolete; stigmas long, entire or deeply parted, the linear lobes inflexed. — A shrub, 4 to 5 feet high, alt. 6,500 feet. The geographical equivalent of the Eastern *S. discolor*, and represented on the western coast by the form known as *S. Scouleriana*.

9. **S. rostrata,** Richardson. Leaves varying from obovate to lanceolate, 1 to 3 inches long, acute or acuminate, thin at first, becoming rigid, serrate or nearly entire, downy or smooth above, glaucous, reticulate-veined and tomentose beneath; stipules usually small and deciduous: *aments* bracteate, *appearing with the leaves;* male sessile, rather short, densely flowered; *female becoming very loose in fruit:* capsules tomentose, tapering from near the base into a very long slender beak; *pedicels thread-like, conspicuously exceeding the pale, rosy-tipped, linear, thinly-villous scales:* style scarcely any; lobes of the stigma entire or deeply parted. — Does not spread from the root, forming a clump, but has rather the habit of a small bushy tree. A reduced form, divaricately much branched and the slender twigs thickly set with small, oblanceolate, mostly entire leaves, is common in the mountains. New England to Vancouver Island and northward to the Saskatchewan.

S. MACROCARPA, Nutt. (*S. Geyeriana*, And.), collected by Geyer on the Cœur d'Alene River in Northern Idaho. is likely to occur within our limits.

+ + Pedicels short or none.

++ Styles distinct.

10. **S. chlorophylla,** Anders. *Leaves* lanceolate or oblong-obovate, quite entire, *bright green above*, glaucous beneath; *stipules none: aments short, closely sessile, naked at base,* cylindrical, *remarkably compact:* scales very dark: capsules sessile, ovate-oblong, obtuse, densely ashy-tomentose, style elongated, entire; stigmas entire. — A straggling bush, 1½ to 6 feet high, at 11,000 feet alt. One-year-old twigs shining chestnut, sometimes covered with a glaucous bloom: buds large, dark-colored: young leaves often silky. Cascade, Wahsatch and Rocky Mountains; northward to the Saskatchewan.

11. **S. candida,** Willd. *Leaves narrowly lanceolate, subcoriaceous*, 2 to 4 inches long, ½ to ¾ inch wide, acute or the lowest obtuse, tapering at base into a short petiole, upper surface downy, becoming nearly glabrous when old, *under surface covered with a dense snow-white tomentum; margin* obscurely crenulate, *revolute:* aments subsessile, erect, cylindrical, when in flower about an inch long, anthers red, when in fruit lengthening to 1½ or 2 inches: scales obovate, clothed with long white hairs: *capsule* ovate-conic, *densely white-woolly;* pedicel about twice the length of the elongated, dark-colored nectary: style elongated, dark red; stigmas short, spreading, notched. — Bogs, foothills of the Rocky Mountains; rare. Near Cutbank Creek, Montana, *Canby;* Colorado, *Hall.* Shrub 2 to 5 feet high: young shoots white-woolly, older shining red.

12. **S. glauca,** L., var. **villosa,** Anders. *Leaves oblanceolate,* acute, attenuate at base, entire, 2 to 4 inches long, varying from soft villous to scarcely pilose when young, at length glabrate and rigid, more or less glaucous beneath; stipules lanceolate: *aments* short-peduncled, cylindrical, the fertile *when mature* sometimes *very large,* 2 to 3 inches long: scales oblong-obovate, rather acute, brownish: *capsules lanceolate-acuminate,* tomentose, at length subglabrate: pedicels equalling the nectary: style produced, entire or deeply bifid; stigmas entire or bifid. — A diffuse shrub, 3 to 7 feet high, with short and stout branches, differing from typical *S. glauca* only in the less woolly and more pointed capsules and the usually entire styles. Low meadows, foot-hills of the mountains.

13. **S. desertorum,** Richards. Leaves elliptical-oblanceolate, rigid, more or less whitish-tomentose beneath, the yellow midrib prominent: *aments very short, subglobose or oblong,* densely flowered: scales pale rose-color, densely white-villous: capsules ovate-conical, white-woolly, sessile: style short; stigmas bifid.

Var.? **Wolfii.** Leaves at length smooth, scarcely paler beneath, with a tendency to blacken in drying: scales very dark, sparingly villous: capsules reddish, glabrate: style entire; stigmas notched. — *S. Wolfii,* Bebb, Bot. Wheeler Exped. 241.

A low, 1 to 2 feet high, scraggy shrub, growing in clumps on alpine slopes far above the timber line. The leaves scarcely exceed an inch in length by 2 or 3 lines in width, the small, roundish compact aments very numerous, less than half an inch long, on short peduncles which are invested with two or three narrow leaf-like bracts often exceeding the ament in length. This is the typical form, *Drummond,* n. 657; *Hall & Harbour,* n. 523. Toward the foot-hills occur "varieties which have a very different aspect, with much larger, more woolly leaves, and longer and looser catkins," (Hooker,) presenting a manifest transition into *S. glauca-villosa.*

14. **S. arctica,** R. Br., var. **petræa,** Anders. Leaves obovate, obtuse or lanceolate and tapering somewhat equally to the base and apex, an inch long, ¼ to ½ inch wide, entire, green on both sides, slightly paler and prominently nerved beneath: *aments terminal,* erect, at length thick and densely flowered, 1 to 2 inches long: scales dark, thinly pilose: capsules ovate-conical, 2 to 3 lines long, tomentose, subsessile, the nectary rather exceeding the base of the capsule: style elongated, slender, entire; stigmas bifid, divaricate. — Far above the timber line in little patches among the rocks, frequently blooming close to snow-banks. A very small creeping shrub, the half-buried horizontal branches sending up short few leaved twigs, which, with the conspicuous aments, rise only 2 to 3 inches above the surface. Colorado, California, and northward in other forms to the limit of vegetation.

++ ++ *Styles none: alpine shrubs with orbicular, reticulate-veined leaves.*

15. **S. vestita,** Pursh. *Leaves* elliptical or oblong-ovate, obtuse, rounded at base, 1 to 2 inches long, obscurely crenulate, strongly reticulate on both surfaces, green above, glaucous beneath, and beautifully *clothed with silky hairs,* especially along the prominent midrib and excurrent veins; *petioles short,* about the length of the large, obtuse buds: aments on short villous peduncles opposite the last of 2 or 3 leaves on the branch, elongate-cylindrical,

densely flowered, the males more slender: scales short, broad-ovate, silky: capsules ovate-conical, sessile, tomentose: style none, lobes of the stigmas bifid. — A procumbent shrub rising 2 to 3 feet above the rocks or boulders over which it spreads, making a dense mass 4 to 10 feet in diameter. Old Marias Pass, Montana, alt. 6 to 8,000 feet, *Sargent & Canby*. Also in Canada and Labrador.

16. **S. reticulata,** L. *Leaves* obovate or elliptic, ½ to 1 inch long, rounded at base or *mostly subattenuate into a long and slender petiole,* quite entire, *glabrous,* green above, glaucous beneath, strongly reticulated, stipules none: aments ½ to 1 inch long on slender peduncles at the ends of the short branches, opposite to the last leaf: scales obovate, purplish or yellow: capsule ovate, tomentose, sessile, nectary "a laciniate cup surrounding the base of the capsule": style very short or none; stigmas 2-cleft, brown, spreading. — A dwarf shrub of high alpine regions, with tortuous, buried stems, the leafy tips and flowers rising a few inches above the surface. Rocky Mountains and northward to the Arctic coast. Our plant is smaller than the European type, with narrower and thinner leaves, less wrinkled above and fewer-flowered aments. Extreme forms, in which the leaves are scarcely more than 2 to 3 lines in length and the aments reduced to 5 to 7 flowers, are designated var. *nivalis,* Hook. sp.

2. POPULUS, Tourn. Poplar. Cottonwood. Aspen.

Trees with broad and more or less heart-shaped or ovate-toothed leaves, and mostly angular branches: buds scaly, covered with a resinous varnish: catkins long and drooping, appearing before the leaves.

1. **P. tremuloides,** Michx. Tree 20 to 50 feet high, with smooth greenish-white bark; *branches not angled: leaves roundish-heart-shaped,* with a short sharp point, and *small somewhat regular teeth, smooth on both sides, with downy margins: scales cut into 3 to 4 deep linear divisions, fringed with long hairs.* — From California eastward across the continent, and northward to the Arctic Ocean; in the Rocky Mountains as far south as New Mexico. The "Quaking Asp." The petiole is long, slender, and laterally compressed.

2. **P. angulata,** Ait. A large tree, 80 feet high or upward; *branches acutely angular or winged: leaves broadly deltoid or heart-ovate, smooth, crenate-serrate,* or with obtuse cartilaginous teeth. — Extending from the Atlantic States into our northeastern border, and abundant along the Platte. "Cottonwood."

3. **P. balsamifera,** L., var. **candicans,** Gray. A tall tree; *branches round: leaves more or less heart-shaped,* pointed, *serrate, whitish and reticulate-veined beneath;* petioles commonly hairy: *scales dilated, slightly hairy:* the large buds varnished with copious fragrant resinous matter. — From Colorado northward and eastward to Lake Superior and New England. Commonly called "Cottonwood."

4. **P. angustifolia,** James. *Branches terete, glabrous: leaves ovate-lanceolate, attenuate at base,* acute, glabrous, *crenate-serrate.* — *P. balsamifera,* var. *angustifolia,* Watson. From New Mexico and Colorado to California and Washington Territory.

Subclass II. MONOCOTYLEDONOUS or ENDOGENOUS PLANTS.

Embryo with one cotyledon. Leaves mostly parallel-veined, alternate, entire, and sheathing at base. Flowers usually in threes.

Order 76. **ORCHIDACEÆ.** (Orchis Family.)

Herbs, distinguished by their perfect irregular flowers, with 6-merous perianth adnate to a 1-celled ovary, with very numerous minute ovules on 3 parietal placentæ, and with one or two gynandrous stamens, the pollen cohering in masses. Perianth of 6 divisions in 2 sets; the 3 outer, or sepals, mostly petal-like and resembling the 3 inner: one of the inner set is variously modified into what is called a *labellum* or *lip*, the other two alone being called petals. Before the lip, in the axis of the flower, is the *column*, composed of a single stamen (more in *Cypripedium*) variously coherent with or borne on the style or thick fleshy stigma; the anther 2-celled, each cell containing one or more masses of pollen, *pollinia*. Stigma a broad glutinous surface (except in *Cypripedium*). — Perennials, often tuberous, sometimes parasitic, with leaves mostly alternate. Flowers showy and singular in shape, arranged for cross-fertilization by means of insects.

Tribe I. Anther one, terminal and resting like a lid upon the column, deciduous; pollen-masses 4, smooth and waxy: leafless, except perhaps a single radical leaf: flowers pedicellate.

1. **Calypso.** Scape 1-flowered, from a solid bulb. Lip saccate. Column broadly-winged. Pollen-masses sessile on a large square membranaceous gland.
2. **Corallorhiza.** Flowers racemose, spurred or gibbous at base. Roots branched, coralline. Lip expanded or concave, crested. Column semiterete. Pollen-masses sessile on a short oblong gland.
3. **Aplectrum.** Flowers racemose, not spurred nor gibbous. Lip expanded, deeply 3-lobed. Column nearly terete. Pollen-masses in distinct pairs, without glands. Rootstocks bearing a solid bulb and a single large green leaf.

Tribe II. Anther one, connate with the column and persistent upon its face just above the stigma; pollen-masses 2, of coarse grains united by an elastic web, each mass attached at base by a stalk to a viscid gland: stems mostly leafy and flowers spicate or racemose.

4. **Habenaria.** Flowers numerous, white or greenish. Lip flat, spurred. Glands exposed.

Tribe III. Anther one, erect and sessile or nearly so upon the top of the column and more or less covering and declinate upon the back of the stigma, persistent; pollen-masses 2 or 4, of loosely cohering granules, becoming attached by their upper ends to a viscid gland on the beak of the stigma: without spurs.

5. **Spiranthes.** Perianth oblique upon the ovary, the sepals and petals connivent: lip oblong, embracing the column, with 2 callosities at base. Flowers 1 to 3-ranked in a twisted spike. Stems leafy below.

6. **Goodyera.** Like the last, but lip saccate, entire, without callosities and free from the column. Leaves all radical, white-reticulated.
7. **Listera.** Perianth spreading. Lip flat, 2-lobed. Stem low, with a pair of broad sessile leaves in the middle.
8. **Epipactis.** Perianth spreading and ovary recurved. Lip somewhat jointed in the middle, concave and auriculate at base, dilated above. Stem leafy, stout.

Tribe IV. Perfect anthers 2, lateral, the sterile one forming a dilated fleshy appendage above the terminal stigma; pollen pulpy-granular.

9. **Cypripedium.** Perianth spreading. Lip an inflated sac. Stems leafy, bearing one or a few showy flowers.

—1. CALYPSO, Salisb.

Petals and sepals ascending, similar and nearly equal; lip with two short spurs below the apex. Column petaloid, oval and concave. Lower pair of pollen-masses smaller, compressed. — A low herb, in bogs, with showy flowers, a scaly-sheathed stem, and a single radical broad thin leaf.

—1. **C. borealis,** Salisb. Stem 3 to 6 inches high, with 2 or 3 membranaceous brownish green sheaths, and a linear acuminate bract at the summit: the radical leaf broadly ovate or slightly cordate: flower drooping: sepals and petals light rose-color; lip usually longer, brownish-pink mottled with purple, the edge margined at the apex and bifid or entire, about equalling the tooth-like spurs and with a tuft of yellow hairs at base. — From Colorado to Oregon and British America; thence eastward to the North Atlantic States.

2. CORALLORHIZA, Haller. Coral-root.

Petals and sepals ascending, similar and nearly equal, but the lateral sepals oblique at base and either decurrent in a short spur adnate to the side of the ovary, or forming a projecting gibbosity above it. Column narrowly margined, broader at base, somewhat incurved. — Without green herbage, the solitary scape with 2 to 4 membranaceous sheaths, and bearing a simple raceme of brownish, yellowish, or purple flowers: pedicels reflexed in fruit.

* *Spur present: lip 3-lobed: flowers small, yellowish-green or whitish, often tinged or mottled with purple.*

1. **C. multiflora,** Nutt. Scape a foot or two high, many-flowered: *sepals and petals 3-nerved; spur manifest, but wholly adnate to the ovary; lip nearly sessile, 3-lobed by a deep cleft on each side,* the middle one rounded or emarginate, with undulate or denticulate margin: *capsule 6 to 9 lines long,* narrowed to a short *rather stout* pedicel. — Across the continent in north temperate latitudes, and in the Rocky Mountains southward to the Wahsatch and Colorado.

2. **C. innata,** R. Br. Scape slender, 4 to 10 inches high, 3 to 15-flowered: *sepals and petals 1-nerved; spur very short; lip somewhat 3-lobed by a lateral cleft, abruptly attenuate to the base;* column stout, constricted in the middle: *capsule 2 to 4 lines long,* abruptly narrowed to a short *very slender* pedicel. — From Colorado to Washington Territory, and thence eastward to Canada and the Atlantic States, and northward to the Arctic regions.

* * *Spur none, the lateral sepals and base of the column strongly gibbous over the top of the ovary: lip entire: flowers larger, purple and veined, not spotted.*

3. **C. striata,** Lindl. Scape stout, a foot or two high, many-flowered: flowers often 6 or 7 lines long; lip fleshy, somewhat narrowed below, reflexed above the base and bearing the prominent laminæ upon the arch. — *C. Macræi*, Gray, Manual, 510. From Washington Territory and Oregon eastward to the Great Lakes.

3. APLECTRUM, Torr. Putty-root.

Lip 3-ridged. Column nearly straight, not broader at base. Scape lateral from a thick globose solid bulb upon a slender horizontal rootstock, the bulb bearing at summit a large petioled plaited leaf. Flowers rather large, soon deflexed.

1. **A. hiemale,** Torr. Scape with 3 or 4 greenish sheaths: the radical leaf ovate-oblong to broadly oblanceolate, 4 to 8 inches long, many-nerved, continuing through the winter: sepals and petals greenish-brown, 5-nerved; lip whitish or somewhat spotted, attenuate into a distinct claw: ovary attenuate into a slender pedicel. — Along our eastern border and eastward to the Atlantic; found also in Oregon.

4. HABENARIA, Willd.

Sepals and petals nearly alike, convergent or the lower sepals spreading. Lip without ridges or callosities. Column very short. Anther-cells parallel or divergent at base. — Stems from fleshy-fibrous or tuberous roots: flowers greenish or white, not showy in our species.

* *Stems slender, bracteate, with* 2 *or* 3 *leaves at base: sepals* 1*-nerved: spur longer than the lip.*

1. **H. Unalaschensis,** Watson. Spike of flowers elongated and rather open: leaves narrowly lanceolate to linear: bracts ovate, not exceeding the ovary: sepals, petals, and lip about a line long, the narrow or somewhat clavate spur scarcely or sometimes nearly twice longer. — *H. fœtida*, Watson, Bot. King Exped. 341. In the Wahsatch, Uinta, and Teton Mountains, and along the Pacific coast to Unalaska.

* * *Sepals* 3*-nerved: spur not longer than the entire lip.*

† *Stem leafy.*

2. **H. hyperborea,** R. Br. *Leaves lanceolate,* erect: spike dense: *flowers greenish; lip and petals lanceolate, somewhat equal,* the latter spreading from the base: *glands orbicular:* stalk of the pollen-masses very slender and weak. — Colorado and northward, thence across the continent.

3. **H. dilatata,** Gray. Like the last, but more slender and with narrower commonly *linear leaves: flowers white; lip lanceolate from a rhomboidal-dilated base,* its base with the bases of other petals and sepals erect-connivent: *glands approximate, large and strap-shaped, vertical,* nearly as long as the pollen-mass and its short flat stalk together. — From Colorado northward and eastward.

+– +– *Scape or stem naked above, one-leaved at the base.*

4. **H. obtusata,** Richardson. Leaf obovate or spatulate-oblong: upper sepal very broad and rounded: lip deflexed, about the length of the tapering and curving spur: anther-cells arcuate and widely separated. — Colorado and northward, thence eastward across the continent.

5. SPIRANTHES, Richard. Ladies' Tresses

Dilated summit of the lip spreading and undulate. Column very short, oblique, terminating in a stout terete stipe. — Flowers small, white.

1. **S. Romanzoffiana,** Cham. Glabrous, rather stout, 4 to 18 inches high: leaves oblong-lanceolate to linear: spike dense, 3-ranked, conspicuously bracteate, 1 to 4 inches long: perianth curved; lip recurved, contracted below the rounded wavy-crenulate summit; callosities smooth, often obscure. — From Colorado northward and ranging across the continent.

6. GOODYERA, R. Br. Rattlesnake Plantain.

Scapes few-bracteate: leaves thickish, rosulate at the base, petioled: root stock creeping, with fibrous fleshy rootlets.

1. **G. Menziesii,** Lindl. Scape and inflorescence pubescent: leaves smooth, ovate-oblong to oblong-lanceolate, reticulated with light greenish markings: spike many-flowered, rather dense, secund: perianth white, puberulent: column short and straight: gland and bifid beak very narrow and elongated. — From Colorado northward, thence eastward along the northern border to W. New York; also in the Pacific States.

7. LISTERA, R. Br. Twayblade.

Sepals and petals similar: lip free, longer than the sepals. Column free and naked. — Stems from fibrous and creeping roots: flowers small, in a loose raceme.

1. **L. convallarioides,** Nutt. Stem slender, 3 inches to a foot high, naked excepting one or two sheaths at base and the pair of *orbicular or ovate leaves* just below the raceme: *inflorescence pubescent: sepals and petals linear; lip oblong-ovate and cuneate,* with a small tooth on each side near the base. — From the Sierra Nevada eastward across the continent.

2. **L. cordata,** R. Br. Leaves smaller, *triangular-ovate and somewhat cordate:* flowers minute, on short pedicels in a *smooth raceme: sepals ovate; lip linear.* — Same range as last.

8. EPIPACTIS, Haller.

Sepals and petals nearly equal: lip narrowly constricted in the middle. Column short, erect. — Stem from creeping rootstocks: flowers few and pedicelled, with conspicuous bracts divergent, and the ovaries at right angles to the stem.

1. **E. gigantea,** Dougl. One to four feet high, nearly smooth: leaves from ovate below to narrowly lanceolate above, somewhat scabrous on the

veins beneath: raceme pubescent: flowers greenish, strongly veined with purple: saccate base of the lip with erect wing-like margins, strongly nerved, and the nerves callous-tuberculate near the base. — W. Texas and S. W. Colorado to California and Washington Territory.

9. CYPRIPEDIUM, L. Lady's Slipper.

Lateral sepals often united into one under the lip: sac-like lip with the incurved margin auricled near the base. — Leaves large and many-nerved, plaited, sheathing at the base. In ours the stem is 1 to 3-flowered, the lip is slipper-shaped and much inflated, and the sepals and linear wavy-twisted petals are brownish, pointed, and longer than the lip.

1. **C. parviflorum,** Salisb. *Sepals ovate or ovate-lanceolate: lip flattish from above, bright yellow, fragrant:* sterile stamen triangular: leaves oval, pointed. — Colorado and eastward.

2. **C. pubescens,** Willd. Stem pubescent: *sepals elongated-lanceolate: lip flattened laterally,* very convex and gibbous above, *pale yellow, scentless:* leaves broadly oval, acute. — Colorado and eastward.

Order 77. IRIDACEÆ. (Iris Family.)

Perennial herbs, with equitant sheathing 2-ranked linear leaves, and perfect triandrous regular flowers, the six divisions of the superior perianth petal-like; stamens on the base of the sepals, with extrorse anthers; ovary 3-celled, becoming a 3-lobed or triangular pod with few or many seeds. — Flowers showy, few or solitary. Style 3-cleft at the apex.

1. **Iris.** Outer segments of the flower recurved, the inner erect. Branches of the style petaloid, opposite the anthers. Filaments distinct. Rootstocks creeping. Seeds flattened.
2. **Sisyrinchium.** Segments similar, spreading. Stigmas filiform, alternate with the anthers. Filaments connate. Roots fibrous. Seeds globular.

1. IRIS, Tourn. Flower-de-Luce. Flag.

Perianth tube prolonged above the ovary. Stamens beneath the arching, petal-like branches of the style. Base of the style connate with the perianth tube; the divisions stigmatic at the thin apex, above which is a broad 2-parted crest, which is decurrent on the inner side to the base of the style. — Stems from usually thickened rootstocks: flowers large and showy, solitary or few in a forked corymb.

1. **I. Missouriensis,** Nutt Stems rather slender, naked or with 1 or 2 leaves, ½ to 2 feet high, usually 2-flowered: leaves mostly shorter than the stem: bracts dilated and scarious: flowers pale blue; sepals and petals 2 or 3 inches long, with narrow claws: seeds obovate, acute at base. — *I. Tolmieana,* Herbert. *I. tenax ?* of Fl. Colorado. From Montana and Colorado westward to the Sierra Nevada, being probably the only species of the Great Basin.

2. SISYRINCHIUM, L. Blue-eyed Grass.

Perianth 6-parted. Capsule membranaceous, subglobose. — Stems simple or branched, usually geniculate and winged, with linear-lanceolate or grass-like radical leaves, and fugacious flowers on slender pedicels, clustered within 2 sheathing herbaceous bracts, with a scarious bractlet subtending each pedicel.

1. **S. anceps,** L. Scape *broadly winged,* and the outer leaf of the very unequal spathe longer than the flowers. — *S. Bermudiana,* var. *anceps,* of Gray's Manual. In the Atlantic States, but extending westward to the Wahsatch and Uintas (*Watson*).

2. **S. mucronatum,** Michx. Scape slender and *narrowly winged:* leaves very narrow, those of the spathe sharp-pointed and unequal, one of them usually longer than the flowers. — *S. Bermudiana,* var. *mucronatum,* of Gray's Manual. Same range as last, but extending farther westward.

Order 78. AMARYLLIDACEÆ.

Like *Liliaceæ,* but ovary inferior. Differs from *Iridaceæ* in having six stamens and leaves not equitant.

1. HYPOXYS, L. Star-grass.

Perianth persistent, spreading; the 3 outer divisions a little herbaceous outside. Pod crowned with the withered or closed perianth. Seeds globular. — Stemless small herbs, with grassy and hairy linear leaves and slender few-flowered scapes, from a solid bulb.

1. **H. juncea,** Smith. Sparingly hairy: scapes 1 to 3, filiform, 1 or 2-flowered, 4 to 9 inches long: bracts bristle-like, shorter than the villous pedicels: the three exterior divisions of the perianth greenish and hairy without: seeds black, minutely fitted. — Colorado (*Brandegee*).

Order 79. LILIACEÆ. (Lily Family.)

Terrestrial plants, mostly herbaceous, with perfect flowers, a regular corolla-like 6-cleft or divided perianth, stamens opposite the segments, ovary 3-celled and superior becoming a few or many-seeded 3-celled capsule or berry. — Stems chiefly from tunicated or scaly bulbs, or corms, or rhizomes. — Watson's Revision, Proc. Am. Acad. xiv. 213.

I. Flowers with scarious bracts, a persistent perianth with segments one to several-nerved, perigynous stamens with introrse anthers, and an undivided and mostly persistent style.

* Inflorescence umbellate upon a naked scape from a bulb or corm; sessile upon a short rootstock in *Leucocrinum.*

← Bracts (usually 2) broad and spathaceous: capsule more or less deeply lobed: perianth cleft nearly to the base: bulb mostly tunicated.

1. **Allium.** Flowers deep rose-color to white. Base of the style enclosed between the lobes of the capsule and jointed upon the short axis. Filaments usually dilated at base. Leaves one to several. Taste and odor strongly alliaceous.
2. **Nothoscordum.** Flowers greenish or yellowish white. Capsule somewhat lobed, with the style obscurely jointed on the summit. Filaments filiform. Leaves several. Bulb not alliaceous.

+ + Bracts several, not spathaceous, distinct: capsule not lobed: perianth funnel-form: scape from a membranous- or fibrous-coated corm.

3. **Brodiæa.** Flowers blue. Stamens 6, in two rows, with naked filaments. Capsule ovate to oblong.
4. **Androstephium.** Flowers pale lilac. Stamens 6, in one row; the filaments united to form an erect tubular crown, with bifid lobes alternate with the anthers. Capsule subglobose-triquetrous.

+ + + Acaulescent: bracts elongated linear: capsule triangular-obovate: perianth salver-form, with linear tube: flowers on subterranean pedicels, from a short rootstock.

5. **Leucocrinum.** Flowers white, very fragrant. Style slender and elongated, dilated at the summit. Leaves narrowly linear, surrounded at base by scarious bracts.

* * Inflorescence racemose or paniculate.

+ Flowers racemose on a naked scape from a tunicated bulb: fruit an ovate or oblong capsule.

6. **Camassia.** Flowers blue (or white), slightly gibbous; segments 3 to 7-nerved, spreading. Base of the style persistent. Raceme open. Leaves linear, flat.

+ + Flowers racemose, racemose-panicled, or in axillary fascicles, on leafy simple stems from creeping rootstocks: fruit a globose berry.

7. **Polygonatum.** Flowers white or greenish, gamophyllous, 6-lobed at the summit, in axillary pedunculate fascicles (or solitary). Stamens on the tube. Style slender, deciduous.
8. **Smilacina.** Flowers white, with distinct perianth-segments, in a racemose panicle or simple raceme. Stamens at the base. Style short, thick, persistent.

+ + + Flowers racemose-paniculate upon a stout leafy or leafy bracteate stem from a stout caudex or thick rootstock; anthers sagittate: fruit a berry or capsule: leaves numerous and crowded, linear, thick and more or less rigid, spinescent at apex.

9. **Yucca.** Perianth campanulate, white or whitish, segments distinct. Filaments clavate. Style stout and persistent. Usually with stout woody caudex.

II. Flower bracts none or foliaceous, a deciduous perianth with net-veined segments, hypogynous stamens with extrorse anthers, deciduous styles united at least at base, and the fruit a loculicidal (except *Calochortus*) capsule or a berry.

* Stems from a bulb or coated corm: fruit a many-seeded capsule: seeds horizontal or ascending.

+ Perianth-segments similar, naked: style long.

++ Bulb scaly: stem simple, strict, leafy: anthers versatile.

10. **Lilium.** Perianth-segments oblanceolate, with a linear nectariferous groove, usually spotted. Style undivided.
11. **Fritillaria.** Perianth-segments broader and concave, often mottled; nectary a shallow pit. Styles united to the middle or throughout.

++ ++ Stem simple, low or dwarf, from a corm or tunicated bulb: anthers basifixed.

12. **Erythronium.** Perianth-segments oblanceolate, strongly revolute, callous-toothed each side of the grooved nectary. Styles usually distinct above. Stem lax, 2-leaved.
13. **Lloydia.** Perianth small, spreading, white with purplish veins and base. Style undivided. Stem leafy, usually 1-flowered. Alpine.

+ + Outer perianth-segments smaller, somewhat sepal-like; the inner broad and usually bearded: stigmas sessile.

14. **Calochortus.** Stem usually branched, from a coated corm. Anthers basifixed. Capsule usually septicidal.

* * Stems from a short or creeping rootstock: fruit a reddish lobed berry: seeds pendulous.

15. **Streptopus.** Flowers apparently axillary, greenish-white or purplish. Anthers sagittate, cuspidate, on short deltoid on subulate filaments. Leaves clasping.

16. **Prosartes.** Flowers in fascicles (1 to 6-flowered) terminating the branches, white or greenish. Anthers oblong, obtuse, on slender filaments. Leaves with reticulated veinlets.

III. Like the last, but perianth persistent with nerved segments, styles distinct, and capsule septicidal (loculicidal in *Xerophyllum*).

* Flowers usually polygamous: anthers 1-celled, peltate on opening: stems leafy: leaves not rigid nor equitant.

17. **Veratrum.** Stem tall and stout, from a thick rootstock. Inflorescence paniculate, pubescent. Leaves broad, strongly nerved and plicate.

18. **Zygadenus.** Stem from a coated bulb. Inflorescence a raceme or subpaniculate, glabrous; perianth-segments glandular at base. Leaves linear.

* * Flowers dioecious, on naked pedicels, in a simple elongated raceme: stem very leafy: leaves thin, oblanceolate.

19. **Chamælirium.** Flowers white: segments narrowly linear-spatulate, equalling the stamens, which are shorter and abortive in the pistillate flowers. Seeds margined, and winged at each end.

* * * Flowers perfect, on bracteolate pedicels, in a simple raceme: anthers 2-celled, introrse: seeds numerous: stem leafy: leaves equitant.

20. **Tofieldia.** Flowers involucrate with 3 scarious united bractlets. Styles short. Seeds appendaged.

* * * * Flowers perfect, on naked pedicels, in a simple dense raceme: styles reflexed: seeds few: stem very leafy: leaves very narrow, rigid and rough-edged.

21. **Xerophyllum.** Flowers white, on long pedicels; segments 5 to 7-nerved. Seeds not appendaged.

1. ALLIUM, L. Onion.

Perianth-segments 1-nerved, usually somewhat spreading. Ovules 2 at the base of each cell. Capsule often crested. Seeds obovoid and wrinkled.

§ 1. *Bulbs cespitose, narrowly oblong and crowning a more or less persistent rhizome: spathe mostly 2-valved: leaves several, linear: scape terete.*

* *Leaves terete, hollow.*

1. **A. Schœnoprasum,** L. Scape stout: umbel subcapitate: flowers rose-color; segments 4 or 5 lines long, acuminate: stamens included: capsule not crested. — From Canada and the Great Lakes to the Wind River Mountains of Wyoming, Oregon, and Alaska.

* * *Leaves flat or channelled.*

2. **A. cernuum,** Roth. Scape slender, ½ to 2 feet high, *from a bulb:* leaves 1 to 4 lines wide: *umbel open, nodding: flowers numerous,* on very slender pedicels, rose-colored or white; *segments 2 or 3 lines long, broad and acutish: stamens and style exserted: capsule crested.* — From New Mexico to Oregon, British Columbia, and the Alleghany Mountains.

3. **A. brevistylum,** Watson. Scape 1 to 1½ feet high, *from a stout rhizome:* leaves 2 to 4 lines wide: spathe 1-valved: *umbel erect, few-flowered,* pedicels 6 to 12 lines long: flowers deep rose-color; *segments 4 to 5 lines long, narrow, long-acuminate, nearly twice longer than the stamens and style: capsule not crested.* — Bot. King Exped. v. 350. N. W. Wyoming to S. Utah.

§ 2. *Bulbs mostly solitary, globose to ovate, not rhizomatous: leaves narrowly linear, flat or channelled: scape terete or nearly so.*

* *Bulb-coats more or less fibrous: leaves several.*

+– *Capsule not crested: spathe usually* 3*-valved.*

4. **A. Canadense,** Kalm. *Bulb-coats somewhat fibrous: scape a foot or more high:* umbel mostly bulbiferous: flowers on slender pedicels (6 *to* 10 *lines long*), white or pinkish; *segments narrowly lanceolate, obtusish, equalling or somewhat exceeding the stamens.* — Along our eastern border and eastward to the Atlantic States.

5. **A. mutabile,** Michx. Like the last: *bulbs densely and coarsely fibrous-coated: scape a foot or two high:* umbel rarely or never bulbiferous: flowers white to rose-color; *segments thin and lax in fruit, ovate to narrowly lanceolate, obtusish or acute, a third longer than the stamens.* — *A. reticulatum,* var. γ, Watson, Bot. King Exped. v. 486. From New Mexico and S. Colorado eastward to the Atlantic States.

6. **A. Nuttallii,** Watson. Bulb usually smaller, *very fibrous: scape low* (4 to 6 inches high): pedicels shorter (4 *to* 6 *lines long*) and usually stouter: *perianth-segments usually broader, acute or acuminate,* rose-colored or white, *rather rigid in fruit.* — Proc. Am. Acad. xiv. 227. *A. mutabile,* var. β, Watson. From Kansas and Colorado southward.

+– +– *Capsule crested: spathe usually* 2*-valved.*

7. **A. reticulatum,** Fraser. Scape 3 to 8 inches high: pedicels usually short (2 to 6 lines long); otherwise closely resembling *A. mutabile.* — From New Mexico and Colorado to the Saskatchewan.

* * *Bulb-coats not fibrous: some of the outer membranous coats in most species marked by a peculiar reticulate venation: leaves several* (2 *to* 4)*: spathe* 2*-valved.*

+– *Ovary not crested or obscurely so: scapes low.*

8. **A. Brandegei,** Watson. Bulbs small, *the reticulation of the coats horizontally oblong:* leaves 2, exceeding the angular scape: pedicels slender, equal, *about* 4 *lines long:* flowers rose-colored; the segments broadly lanceolate, *acute,* nearly twice longer than the stamens, *not serrulate.* — Proc. Am. Acad. xvii. 380. Elk Mountains, Colorado (*Brandegee*).

9. **A. acuminatum,** Hook. *Outer bulb-coats with a distinct coarse quadrate to hexagonal reticulation: pedicels* 6 *to* 12 *lines long:* flowers deep rose-color; segments lanceolate, *with acuminate recurved tips, rigid in fruit,* a third longer than the stamens, *the inner ones undulate-serrulate.* — From S. W. Colorado to the Wahsatch and Uinta Mountains, N. California and Washington Territory.

+– +– *Ovary conspicuously* 6*-crested: perianth-segments not serrulate, mostly rose-colored.*

10. **A. stellatum,** Fraser. *Outer bulb-coats reddish,* with a very close linear longitudinal reticulation: *scape* 6 *to* 18 *inches high:* pedicel 4 to 9 lines long: *perianth-segments broad, acute: stamens and style exserted.* — From Wyoming to the Saskatchewan.

11. **A. bisceptrum,** Watson. *Bulbs light-colored;* reticulation indistinct: *scapes lower, frequently in pairs: perianth-segments oblong-lanceolate, acuminate,*

slightly exceeding the stamens: the alternate filaments with a broad deltoid adnate base. — Bot. King Exped. v. 351, pl. 37. In the Wahsatch Mountains and westward to the Sierra Nevada.

* * * *Bulb-coats not fibrous: leaf solitary, narrowly linear or filiform, equalling or somewhat exceeding the low scape* (1 *to* 3 *inches*)*: capsule prominently* 6*-crested: stamens and style included.*

12. **A. Nevadense,** Watson. Bulb-coats light-colored, with evident close very much distorted reticulation: spathe-valves acuminate: leaf flat: pedicels half-inch long: perianth white or pinkish; segments lanceolate, little exceeding the stamens and style. — Bot. King Exped. v. 351, pl. 38. From the Wahsatch Mountains to the Sierra Nevada.

§ 3. *Bulbs ovate, not rhizomatous, the membranous coats mostly without reticulation: leaves* 2*, broadly linear, flat and falcate, thick: scape stout, much compressed and* 2*-winged, low and mostly shorter than the leaves.*

13. **A. Tolmiei,** Baker. Scape 2 to 4 inches high: spathe 2-valved: flowers light rose-color with a darker midvein; segments lanceolate, acute, gibbous at base, a half longer than the stamens: ovary very obscurely crested. — *A. tribracteatum,* Watson in Bot. King Exped. v. 353, in part. From the Wahsatch Mountains to S. Idaho.

2. NOTHOSCORDUM, Kunth.

Like *Allium.* Capsule oblong-obovate; cells several-ovuled. Bracts 2. Bulb tunicated.

1. **N. striatum,** Kunth. Bulb small, often bulbiferous at base: leaves a line or two broad: scape a foot high or often much less: flowers few, on slender pedicels: capsule 2 lines long. — *Allium striatum,* Jacq. From New Mexico to Nebraska and eastward to Virginia and Florida.

3. BRODIÆA, Smith.

Scape erect, with linear leaves: flowers on jointed pedicels: brown-coated corms small, $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter or less. In ours the perianth is broadly tubular and the flowers subcapitate.

1. **B. Douglasii,** Watson. Scape smooth, a foot or two high, erect and usually stout: leaves carinate: perianth-tube subsaccate, about equalling the lobes: anthers oblong; the lower on the throat opposite the outer segments, the upper on the inner segments, on a short free filament which forms below a prominent wing within the tube. — Bot. Calif. ii. 154. *Milla grandiflora,* Baker. "Blue Cammas." From W. Wyoming and the Wahsatch to Oregon and Washington Territory.

4. ANDROSTEPHIUM, Torr.

Perianth 6-cleft, the cylindric tube nearly equalling or shorter than the lobes. — Scape bearing a few-flowered umbel with unjointed pedicels: leaves narrowly linear, channelled.

1. **A. violaceum,** Torr. Scape 2 to 6 inches high: flowers 8 to 12 lines long or more, usually exceeding the stout pedicels; tube nearly as long as the limb; crown scarcely shorter than the limb, the lobes exceeding the anthers. — Bot. Mex. Bound. 218. W. Kansas to Texas.

5. LEUCOCRINUM, Nutt.

Stamens 6: filaments inserted below the throat. — Blooming in early spring, the pure white and very fragrant flowers appearing just above the ground.

1. **L. montanum,** Nutt. Leaves several, rather thick: flowers 4 to 8, the very slender tube an inch or two long: capsule truncate, with 4 to 6 seeds in each cell. — From Colorado to N. California.

6. CAMASSIA, Lindl. Camass.

Stamens 6, on the base of the perianth, shorter than the segments. Style slightly trifid at the apex. — Flowers in a simple raceme, with narrow scarious bracts; pedicels jointed at the summit.

1. **C. esculenta,** Lindl. Scape stout, a foot or two high: pedicels rather stout, mostly shorter than the usually dark-blue flowers: perianth-segments scarcely exceeding the style, a little longer than the stamens. — From the Wahsatch Mountains, northward and westward. The bulb largely collected for food by the Indians, and called "Green Cammas."

7. POLYGONATUM, Tourn. Solomon's Seal.

Ovules 1 to 3 pairs in each cell. Berry blue or black; cells 1 to 2-seeded. — Stem somewhat curved: leaves sessile: bracts caducous, minute.

1. **P. giganteum,** Dietr. Glabrous throughout: stem 2 to 7 feet high: leaves broadly ovate to lanceolate, usually clasping by a broad base: pedicels jointed below the base of the flower. — From the Upper Missouri and New Mexico to New England and Virginia.

8. SMILACINA, Desf. False Solomon's Seal.

Stamens 6: filaments subulate. Stigma 3-lobed at the summit: ovules 2 in each cell. — Stems simple, leafy, from running rootstocks: leaves mostly sessile, oblong or lanceolate: pedicels jointed at the summit.

* *Flowers in a terminal racemose panicle: stamens exserted: berry reddish.*

1. **S. amplexicaulis,** Nutt. More or less pubescent: stem 1 to 3 feet high: leaves ovate to lanceolate, mostly sessile and clasping at base: style nearly equalling the ovary. — *S. racemosa,* var. *amplexicaulis,* Watson, Bot. King Exped. v. 345. From New Mexico to Wyoming and westward to California and British Columbia.

* * *Flowers in a simple few-flowered open raceme: stamens included: berry blue-black.*

2. **S. stellata,** Desf. Glabrous or pubescent: stem a foot high or less: leaves lanceolate, *acutish, sessile and closely clasping, usually ascending and*

folded: raceme about an inch long. — From New Mexico to Oregon and Labrador.

3. **S. sessilifolia,** Nutt. Rootstock slender: stem a foot or two high: leaves lanceolate, *acuminate, sessile, usually flat and spreading,* somewhat puberulent: *raceme larger and pedicels longer* (2 to 7 lines). — Watson in Proc. Am. Acad. xiv. 245. From the Wahsatch to California and British Columbia. Usually referred to *S. stellata.*

9. YUCCA, L. Spanish Bayonet.

Segments of perianth ovate-lanceolate, many-nerved. Stigmas emarginate and more or less connate into a stigmatic tube. Fruit incompletely 6-celled. Flowers usually solitary and nodding. — In ours the caudex is short or none.

* *Fruit baccate, pendulous: seeds thick, rugose, not margined, with lobed or ruminated albumen.*

1. **Y. baccata,** Torr. Leaves coarsely filamentose on the margin, very thick and rigid, 1½ to 3 feet long by an inch or two wide, channelled or concave, rough especially on the back, tipped by a very stout brown spine: panicle pedunculate: perianth-segments narrow, 2½ to 3 inches long: fruit oval or cylindric, dark purple, often long-beaked. — S. Colorado and W. Texas to S. California and Northern Mexico.

* * *Fruit capsular, erect: seeds thin, smooth, broadly margined, with entire albumen.*

2. **Y. angustifolia,** Pursh. Leaves filamentose on the margin, very stiff and pointed, usually 1 to 3 feet long by 3 to 6 lines wide, smooth: raceme usually simple, nearly sessile, 1 to 4 feet long: flowers greenish-white or tinged with brown; segments broadly ovate, an inch or two long: fruit 6-sided. — From New Mexico to Dakota.

10. LILIUM, L. Lily.

Stems leafy, simple: leaves narrow, sessile, whorled or scattered, net-veined: flowers large and showy, in ours usually solitary and erect.

1. **L. Philadelphicum,** L. Bulb small, of thick fleshy jointed scales: leaves linear-lanceolate, whorled or scattered: perianth-segments reddish-orange, coarsely spotted on the lower half, acute, spreading, abruptly narrowed to the claw. — From Colorado to the Saskatchewan and eastward to N. Carolina and Canada.

11. FRITILLARIA, L.

Stems erect, simple, leafy: flowers often nodding and much smaller than in *Lilium.*

1. **F. atropurpurea,** Nutt. Bulb of numerous thick scales: *stem 8 to 15 inches high or more,* 1 to 6-flowered: *leaves 6 to 20,* scattered or somewhat verticillate: *flowers dull purple with more or less of yellowish green: styles distinct above; stigmas linear: capsule acutely angled, broadly obovate.* — From Wyoming to the Sierra Nevada.

2. **F. pudica,** Spreng. Bulb of numerous very small rounded scales: *stem 3 to 8 inches high,* 1 to 6-flowered: *leaves 3 to 8,* scattered or somewhat verticillate: flowers usually solitary, *nodding, yellow or orange and tinged with purple: styles connate and stigma shortly 3-lobed: capsule oblong to subglobose.* — From Utah and Montana to the Sierra Nevada and British Columbia.

12. ERYTHRONIUM, L. Dog's-tooth Violet.

Stem bearing near the base a pair of closely approximate flat dilated net-veined leaves: flowers showy, solitary or few in a naked raceme.

1. **E. grandiflorum,** Pursh. Leaves not mottled, opposite: flowers 1 to 6, yellow or cream-colored, with a more or less orange base, 1 or 2 inches long: capsule narrowly oblong.

Var. **minor,** Morren. Flowers smaller, an inch long, bright yellow. — Colorado and Utah.

13. LLOYDIA, Salisb.

The bulb upon an oblique rhizome, covered by the persistent scarious bases of the nearly filiform leaves.

1. **L. serotina,** Reichenb. Stem 2 to 6 inches high, equalling the leaves: flowers erect; perianth-segments oblanceolate, obtuse, obscurely pitted at base. capsule obovate, obtusely angled: seeds chestnut-colored. — Mountains of Colorado and northward throughout the alpine and arctic regions of the northern hemisphere.

14. CALOCHORTUS, Pursh.

Stems usually flexuous and branching: leaves few, linear-lanceolate, radical and cauline, the latter alternate and clasping, all with many nerves and transverse veinlets: flowers few, showy. In ours the flowers are open-campanulate, white or lilac, with densely hairy glands, and the capsule narrowly oblong with thick obtusely angled lobes.

1. **C. Nuttallii,** Torr. & Gray. Stem slender, bulbiferous at base, with a single narrow cauline leaf (sometimes 2 or 3), umbellately 1 to 5-flowered: sepals often with a dark or hairy spot: petals an inch or two long, *white tinged with greenish yellow or lilac, with a purplish spot or band above the yellow base,* and hairy around the *circular or oblong gland: anthers obtuse.* — Pacif. R. Rep. ii. 124. From New Mexico and Colorado to Dakota and California.

2. **C. Gunnisoni,** Watson. Like the last, but with *acuminate anthers and a broad transverse gland: petals light lilac, yellowish green below the middle, banded and lined with purple.* — Bot. King Exped. v. 348. Mountains from Wyoming to New Mexico.

15. STREPTOPUS, Michx.

Stems rather stout, with forking and divergent branches, ovate and taper-pointed rounded-clasping membranaceous leaves, and small flowers on slender peduncles, which are abruptly bent or contorted near the middle.

1. **S. amplexifolius,** DC. Stem 2 to 3 feet high: leaves very smooth, glaucous underneath: anthers tapering to a slender point: stigma entire, truncate. — Across the continent in northern latitudes and ranging south to New Mexico.

16. PROSARTES, D. Don.

Low and pubescent, divergently branched above, with closely sessile ovate and membranaceous leaves, and drooping flowers. In ours the stigma is 3-cleft.

1. **P. trachycarpa,** Watson. Leaves ovate to oblong-lanceolate, acute or rarely acuminate: perianth-segments whitish, slightly spreading, acute: fruit broadly obovate, obtuse and rather deeply lobed, papillose. — Bot. King Exped. v. 344. Colorado to Utah and the Saskatchewan.

17. VERATRUM, Tourn. False Hellebore.

The pubescent panicle mostly staminate below, with green or greenish bracts. In ours the leaves are broad-elliptical and sheathing, the ovary glabrous, and the capsule many-seeded.

1. **V. Californicum,** Durand. Stem 2 to 7 feet high: upper leaves lanceolate, but rarely acuminate: branches of the sometimes compound panicle ascending: perianth-segments obtuse, whitish with greener base, often denticulate above. — *V. album,* Watson. From Colorado and Wyoming to N. California and Oregon.

18. ZYGADENUS, Michx.

Stem from a coated bulb crowning a short rhizome, with narrowly linear obscurely nerved leaves mostly near the base: otherwise as *Veratrum.* In ours the gland covers more or less of the base of the perianth-segments.

* *Flowers rather large, mostly perfect.*

1. **Z. elegans,** Pursh. Stem ½ to 3 feet high: leaves glaucous, 2 to 6 lines broad: *raceme often few-flowered: bracts ovate-lanceolate,* usually purplish: *perianth adnate at base;* segments broad, greenish, *the inner abruptly contracted to a broad claw; gland obcordate.* — *Z. glaucus,* Nutt. From New Mexico to Oregon and Canada.

2. **Z. Nuttallii,** Gray. Stem stout, 2 feet high: leaves 3 to 8 lines broad: *raceme rather densely flowered, with narrow membranous bracts: perianth free from the ovary; segments not clawed, with an ill-defined gland at base.* — Manual, 525. From Colorado to Texas.

* * *Flowers smaller, polygamous.*

3. **Z. venenosus,** Watson. *Stem slender,* ½ to 2 feet high: *leaves* 2 *or* 3 *lines broad,* scabrous, the cauline not sheathing: *raceme simple,* short: *perianth-segments triangular-ovate to elliptical, obtuse or rarely acutish,* all abruptly contracted to a short glandular claw; gland extending slightly above the claw with a well-defined irregular margin: seeds 1½ to 2½ lines long. — Proc. Am. Acad. xiv. 279. From the Wahsatch to California and British Columbia. Known as "Death-Camass" or "Hogs' Potato."

4. **Z. paniculatus,** Watson. Very similar: *usually stout: leaves 3 to 8 lines broad,* usually all sheathing: *raceme compound: perianth-segments deltoid, acute or acuminate;* gland less definitely margined, often reaching nearly to the middle of the blade: *seeds 3 to 5 lines long.* — Bot. King Exped. v. 344. From the Wahsatch Mountains to California and the Saskatchewan.

19. CHAMÆLIRIUM, Willd. Devil's-Bit.

Stem wand-like, from a thick and abrupt tuberous rootstock, terminated by a long spiked raceme of small bractless flowers: fertile plant more leafy than the staminate.

1. **C. Carolinianum,** Willd. Stem 1 to 4 feet high: lower leaves spatulate-oblanceolate, 2 to 6 inches long, the cauline narrower. — *C. luteum,* Gray, Manual, 527. Coming into our eastern limit in W. Nebraska and extending eastward.

20. TOFIELDIA, Huds. False Asphodel.

Mostly tufted, with fibrous roots, and simple stems leafy only at base, bearing small flowers in a close raceme: leaves linear, grass-like. Ours has stem and inflorescence pubescent, and pedicels fascicled.

1. **T. glutinosa,** Willd. Glutinous-pubescent: stem slender, ½ to 1½ feet high: raceme short: pedicels bearing the scarcely lobed involucre near the flower: capsule shortly beaked: seeds minute, with brownish testa, and a contorted tail at each end. — From Wyoming to Oregon and northward, also eastward to Canada and N. Carolina.

21. XEROPHYLLUM, Michx.

Stem from a bulbous base, bearing a compact raceme of showy white flowers, thickly beset with needle-shaped leaves, the upper ones reduced to bristle-like bracts; those from the root very many in a dense tuft.

1. **X. Douglasii,** Watson. Stem 2 to 4 feet high: leaves often 2 or 3 feet long: pedicels ½ to 1¼ inches long: flower-segments 2½ lines long, exceeding the stamens: capsule cordate-ovate, 6-valved, the abruptly acute cells separating and then dehiscing. — Proc. Am. Acad. xiv. 284. *X. tenax* of the Hayden Reports. Headwaters of the Yellowstone and westward to Oregon.

Order 80. SMILACEÆ. (Smilax Family.)

Shrubby or rarely herbaceous plants, climbing or supported by a pair of tendrils on the petiole of the ribbed and netted-veined simple leaves; with dicœcious small flowers; regular perianth of 6 similar deciduous sepals, free from the ovary; as many stamens as sepals; with introrse 1-celled anthers; ovary with 3 cells and as many elongated spreading sessile stigmas.

1. SMILAX, Tourn. Green Brier.

Characters of the order: flowers in umbels.

1. **S. rotundifolia,** L. Stem armed with scattered prickles, as well as the terete branches: branchlets more or less 4-angular: leaves ovate or round-ovate, slightly heart-shaped, abruptly short-pointed: berries blue-black, with a bloom. — Colorado and eastward.

Order 81. COMMELYNACEÆ. (Spiderwort Family.)

Herbs, with fibrous or sometimes thickened roots, jointed and often branching leafy stems, and chiefly perfect and 6-androus, often irregular flowers, with the perianth free from the 2 to 3-celled ovary, and having a distinct calyx and corolla, of 3 persistent sepals and as many ephemeral or deciduous (in ours blue) petals. Style one, stigma undivided. Pod 3 to several-seeded. — Leaves ovate, lanceolate or linear, parallel-veined, flat, sheathed at the base; the uppermost often forming a kind of spathe.

1. **Commelyna.** Flowers irregular. Three stamens fertile and three sterile and smaller: filaments naked.
2. **Tradescantia.** Flowers regular. Stamens all fertile: filaments bearded.

1. COMMELYNA, Dill. Day-Flower.

Sepals somewhat colored, unequal; the 2 lateral partly united by their contiguous margins. Two lateral petals rounded, on long claws, the odd one smaller. Sterile stamens with imperfect cross-shaped anthers. — Stems branching, often procumbent and rooting at the joints: floral leaf heart-shaped and clasping, folded together or hooded, forming a spathe enclosing the flowers, which expand for a single morning and are recurved on their pedicels before and afterwards.

1. **C. Virginica,** L. Stems slender, erect, or reclined and rooting towards the base: leaves oblong- or linear-lanceolate: spathes peduncled, conduplicate, round-heart-shaped when expanded, in fruit somewhat hood-like. — E. Colorado and eastward to New York.

2. TRADESCANTIA, L. Spiderwort.

Sepals herbaceous. Petals all alike, ovate, sessile. — Stems mostly upright, nearly simple, leafy: leaves keeled: flowers ephemeral, in umbelled clusters, terminal (in ours): floral leaves nearly like the others.

1. **T. Virginica,** L. Leaves lance-linear, elongated, tapering from the sheathing base to the point, ciliate: umbels sessile, clustered, usually involucrate by 2 leaves, many-flowered. — From New Mexico northward and eastward across the continent.

Order 82. **JUNCACEÆ.** (Rush Family.)

Grass-like or sedge-like herbs, with small flowers, a regular and hypogynous persistent perianth of 6 similar glumaceous sepals, 6 or rarely 3 stamens, a single short style, 3 filiform hairy stigmas, and an ovary 1 or 3-celled. — Plants with liliaceous flowers and sedge-like appearance and texture.

1. **Luzula.** Pod 1-celled, 3-seeded. Plant often hairy.
2. **Juncus.** Pod 3-celled, or 1-celled by the placentæ not reaching the axis, many-seeded. Plant never hairy.

1. LUZULA, DC. Wood-Rush.

Pod with one seed to each parietal placenta. Generally in dry ground, with usually flat and soft usually hairy leaves, and spiked-crowded or umbelled flowers.

* *Pedicels 1-flowered, in a loose compound cyme.*

1. **L. spadicea,** DC. Glabrous or slightly villous: stems 6 to 18 inches high or more: inflorescence lax and nodding, much exceeding the usually small involucral bracts: perianth straw-color or more or less tinged with brown; segments slightly shorter than the acute apiculate capsule: anthers much exceeding the filaments: seed oblong, brownish, not appendaged. — Ranging from the Arctic Ocean southward into California, Colorado, and the N. Atlantic States; chiefly the following varieties:

Var. **parviflora,** Meyer. Inflorescence often 3 to 6 inches long, with elongated unequal drooping branches and slender pedicels: flowers smaller: anthers about equalling the filaments.

Var. **melanocarpa,** Meyer. Similar, but capsule dark brown. — *L. parviflora,* var. *melanocarpa,* Gray, Manual.

Var. **subcongesta,** Watson. Like the others, but the pedicels short and more or less fascicled at the ends of the branches of the cyme. — Bot. Calif. ii. 202.

* * *Flowers spicate: spikes erect, mostly pedunculate in a cymose umbel.*

2. **L. comosa,** Meyer. *Villous:* stem 6 to 15 inches high, leafy: *the foliaceous bract usually exceeding the inflorescence:* peduncles 2 to 12, unequal, the longer 1 to 3 inches long: *spikes simple, usually oblong, loosely flowered: perianth pale* or somewhat tinged with brown, equalling the capsule: anthers small, equalling the filaments: seed dark, *with a white conical appendage sometimes half as long as the seed.* — The type, together with the following varieties, ranges from the Rocky Mountains westward and northward.

Var. **macrantha,** Watson. *Perianth* longer, *much exceeding the capsule: anthers equalling or twice longer than the filaments:* seed larger, the appendage always short. — Bot. Calif. ii. 203.

Var. **subsessilis,** Watson. *Spikes* solitary or few, *nearly sessile,* loose; perianth-segments lax and scarious. — Bot. Calif. loc. cit.

3. **L. campestris,** DC. Similar to the preceding type, but usually less villous: *bracts short: spikes dense, short, and ovate: perianth-segments often*

dark-brown. — Rather rare in California, Colorado, etc., but common in the Atlantic States.

4. **L. spicata,** Desv. *Leaves carinate and folded: flowers in a solitary and compound dense nodding spike: seed not appendaged.* — An alpine species in the mountains of Colorado, and in similar situations northward and eastward.

2. JUNCUS, L. Rush. Bog-Rush.

Stamens when 3 opposite the 3 outer sepals. — Generally in wet soil or water, with pithy or hollow simple stems, and panicled or clustered small greenish or brownish flowers.

* *Scape naked, the basal sheath also leafless, or rarely bearing terete leaves similar to the scape: flowers in sessile apparently lateral panicles: stamens* 6 *in ours.* — True Juncı.

+– *Flowers many; panicle more or less compound: sheaths leafless.*

1. **J. Balticus,** Deth. *Rather stout:* sepals nearly equal and similar, or the inner more obtuse: *capsule ovate-pyramidal, angled, beaked:* seeds smaller, narrower, and longer apiculate than in the eastern form. — Ranging across the continent. Known as "Wire grass."

2. **J. filiformis,** L. *Very slender: panicle almost simple:* sepals exceeding the *broadly ovate obtuse short-pointed greenish capsule.* — From Colorado to the Saskatchewan and eastward across the continent.

+– +– *Flowers few; panicle scarcely ever compound: sheaths often leaf-bearing: seeds caudate: low and alpine.*

3. **J. Drummondii,** E. Meyer. Stems 1 to 1½ feet high, terete and filiform: *sheaths bristle-pointed:* spathe more or less exceeding the simple 1 to 3-flowered panicle: *capsule ovate-oblong, triangular, retuse: seeds ovate.* — Mountains of Colorado to California and northward.

4. **J. Hallii,** Engelm. Stems 6 to 12 inches high, terete and filiform, much longer than the *terete bristleform leaves:* spathe scarcely exceeding the close subsimple 2 to 5-flowered panicle: *sepals white-margined: capsule ovate, angled, retuse: seeds oblong-linear.* — Trans. St. Louis Acad. ii. 446. Colorado.

5. **J. Parryi,** Engelm. Stems 4 to 8 inches high, setaceous, longer than the *sulcate subterete leaves:* spathe exceeding the 1 to 3-flowered panicle: *outer sepals bristle-pointed: capsule prismatic, pointed: seeds oblong.* — Loc. cit. Mountains of Colorado to California and northward.

* * *Stems naked or leafy: leaves flat, or semi-terete and channelled, never knotted: panicle or head evidently terminal: stamens* 6 *in ours.* — Grassy-leaved Juncı.

+– *Alpine: seeds caudate: leaves fistulous: flowers in small heads.*

6. **J. triglumis,** L. Leaves roundish, channelled and 2 to 3-tubular below, flattened upward: *sheaths auricled at top: head equalling the membranous spathe: capsule elliptical, acute.* — Mountains of Colorado and northward to the Arctic coast.

7. **J. castaneus,** Sm. Stem leafy: leaves terete, deeply channelled at base: *heads somewhat in pairs* sessile or peduncled, *shorter than the rather large spathe: capsule oval-triangular and rather long mucronate.* — Mountains of Colorado northward to British America and thence across the continent.

+– +– *Flowers solitary, panicled.*

–+ *Stems slender, simple, tufted, leafy below.*

8. **J. Vaseyi,** Engelm. *Leaves slightly channelled at base:* panicle light-colored, loose, few-flowered: capsule ovate, retuse: *seeds conspicuously caudate at both ends.* — Loc. cit. From Colorado to Michigan and the Saskatchewan.

9. **J. tenuis,** Willd. *Leaves flat:* perianth-segments pale: sepals exceeding the ovoid retuse green capsule: *seeds white-pointed at both ends.* — Everywhere throughout the United States.

Var. **congestus,** Engelm. *Panicle contracted and somewhat capitate:* perianth and capsule darker. — Loc. cit. 450. Colorado and California.

–+ –+ *Stems branched, diffused, leafy.*

10. **J. bufonius,** L. Low and slender: panicle spreading, mostly with one-sided dichotomous branches: the 3 outer sepals much longer than the inner and than the oblong obtuse pod: seeds elliptical, obtuse. — Common everywhere.

+– +– +– *Flowers capitate: seeds not caudate.*

11. **J. longistylis,** Torr. & Gray. Stems 1 to 2 feet high, leafy: leaves flat, grass-like: heads few in a contracted panicle, or rarely single: flowers greenish with brown lines: sepals equal, a little shorter or equalling the ovate, obtuse, mucronate or rostrate, chestnut-colored capsule: seeds oblanceolate or obovate, pointed. — From New Mexico to the Saskatchewan and Washington Territory.

* * * *Stem leafy: leaves knotted by internal cross-partitions: panicle terminal, with the flowers in heads.* — KNOTTY-LEAVED JUNCI.

+– *Leaves terete or slightly compressed.*

–+ *Seeds barely pointed: stamens* 6.

12. **J. alpinus,** Vill., var. **insignis,** Fries. Stem 9 to 18 inches high: panicle erect, elongated, greenish or light-brown; *heads few-flowered: sepals obtuse: capsules* light-brown, *obtuse, mucronate, 3-celled: seeds spindle-shaped.* — From Colorado northward, also eastward to New York.

13. **J. nodosus,** L., var. **megacephalus,** Torr. Stem stout, 1 to 3 feet high, with thick leaves: panicle pale green; *heads many-flowered: sepals awl-pointed: capsules* slender, triangular, *taper-pointed, one-celled: seeds obovate, abruptly mucronate.* — From New Mexico to California and New York.

–+ –+ *Seeds caudate: stamens* 3.

14. **J. Canadensis,** J. Gay. Tufted stems erect, bearing 2 or 3 leaves: heads few to many-flowered: outer sepals the shorter: capsule triangular-prismatic, one-celled, mostly exsert and short-pointed.

Var. **coarctatus,** Engelm. Stem slender, bearing fewer deep-brown 3 to 5-flowered heads in a somewhat erect contracted panicle: sepals much shorter than the pod. — Gray's Manual, 544. Yellowstone Park; also eastward from Wisconsin to New England.

+– +– *Leaves compressed and equitant, ensiform: stem compressed and usually acutely edged.*

15. **J. Mertensianus,** Meyer. Stems weak, from slender matted root-stocks, 6 to 18 inches high, *not* 2-*edged: leaves very narrow, the sheaths with ligules: heads solitary,* densely many-flowered, dark brown: *capsule obovate, obtuse.* — From Colorado to California and Alaska.

16. **J. xiphioides,** Meyer. Stems from a thick creeping rootstock, 2 to 4 feet high, 2-*edged: leaves usually broad, the sheaths without ligules: heads numerous,* brownish, few to many-flowered, in a compound panicle: *capsule oblong, acute.*

Var. **montanus,** Engelm. Lower and leaves narrower: heads few, usually many-flowered. — Trans. St. Louis Acad. ii. 481. From New Mexico to Washington Territory and the Saskatchewan.

Order 83. **TYPHACEÆ.** (Cat-tail Family.)

Marsh or aquatic herbs, with nerved and linear sessile leaves, and monœcious flowers on a spadix or in heads, destitute of proper floral envelopes. Ovary tapering into a style. Fruit nut-like, 1 or 2-seeded.

1. **Typha.** Flowers in a long very dense cylindrical spike terminating the stem.
2. **Sparganium.** Flowers in separate dense spherical leafy-bracted heads, which are scattered along the summit of the stem.

1. TYPHA, Tourn. Cat-tail Flag.

Upper part of the spike consisting of stamens only, intermixed with long hairs; the lower or fertile part consisting of ovaries, surrounded by club-shaped bristles. Nutlets minute, very long-stalked. — Leaves long, sheathing the base of the simple jointless stems.

1. **T. latifolia,** L. Leaves flat: staminate and pistillate parts of the spike approximate. — Across the continent.

2. SPARGANIUM, Tourn. Bur-reed.

The upper heads consisting of stamens only, with minute scales irregularly interposed; the lower larger, consisting of numerous sessile pistils, each surrounded by 3 to 6 scales. Fruit wedge-shaped or club-shaped. — Stems simple or branching, sheathed below by the base of the linear leaves.

* *Erect, with branched inflorescence of numerous heads: pistil as long as the truncate scales: nuts sessile, wedge-shaped, angular: leaves mostly flat and merely keeled, the base triangular with concave sides.*

1. **S. eurycarpum,** Engelm. Stems stout, 2 to 4 feet high: fruit many-angled when ripe, with a broad and depressed summit abruptly tipped in the centre. — From Nevada northward and eastward across the continent.

* * *Erect or rarely floating, with simple or branched inflorescence of numerous heads: pistil with conspicuous style longer than the spatulate denticulate scales: nuts attenuated at both ends, with a stalked base, nearly terete: leaves floating or triangular with flat sides in the lower half.*

2. **S. simplex,** Hudson. Erect, 9 to 15 inches high, slender: inflorescence simple, the lower heads supra-axillary, sessile or peduncled: fruit more or less contracted in the middle. — Across the continent. Exceedingly variable, the following varieties coming within our range:

Var. **androcladum,** Engelm. Stouter and taller: inflorescence branched below; branches bearing numerous sterile heads: fruit larger, not contracted, long-tapering at both ends. — Gray's Manual, 481.

Var. **angustifolium,** Engelm. Leaves floating: inflorescence simple: fruit smaller, short-stiped, contracted in the middle. — Loc. cit.

* * * *Usually floating, with very slender stems and delicate always flat and narrow leaves: inflorescence simple, of few small heads: scales oval or obovate, denticulate: nuts oval, with a very short stipe and short point.*

3. **S. minimum,** Bauhin, Fries. Fertile heads solitary or two, axillary, sessile, or the lower one peduncled: nuts somewhat triangular, contracted below: stems when out of the water only 5 to 6 inches high. — Uinta Mountains, and northward, thence eastward to New England.

Order 84. LEMNACEÆ. (Duckweed Family.)

Minute stemless plants, floating free on the water, destitute of distinct stem and foliage, being merely a disk-like frond producing one or few monœcious flowers from the edge or upper surface, and commonly hanging roots from underneath; fruit a utricle, and seed large.

1. **Lemna.** Frond 1 to 5-nerved, with a single rootlet.
2. **Speirodela.** Frond 7 to 11-nerved, with several rootlets.

1. LEMNA, Linn. Duckweed. Duck's-meat.

Flowers marginal, bracteate, diandrous. Anther-cells bilocellate by a transverse partition, dehiscing transversely. Seeds 1 to 6. — Rootlet destitute of vascular tissue.

1. **L. trisulca,** L. *Fronds thin, oblong or oblong-lanceolate, attenuate at base into a slender stalk,* very obscurely 3-nerved, *usually several series of offshoots remaining connected:* seeds ovate. — From New Mexico to Oregon, the Saskatchewan, and eastward through most of North America.

2. **L. minor,** L. *Fronds rather thick, round- to elliptic-obovate, sessile,* very obscurely 3-nerved, *the offshoots soon separating:* seeds oblong-obovate. — Abundant everywhere, closely covering the surface of stagnant pools.

2. SPEIRODELA, Schleiden.

Like *Lemna,* but anther-cells bilocellate by a vertical partition and dehiscent longitudinally, and ovary 2-celled. — Rootlets with axile vascular tissues.

1. **S. polyrrhiza,** Schleid. Fronds round-obovate, purple beneath: roots clustered, usually 3 to 5. — *Lemna polyrrhiza,* L. Nevada, Montana, Wyoming, and eastward throughout the continent. Very rarely seen in flower or fruit.

Order 85. **ALISMACEÆ.** (Water-Plantain Family.)

Marsh herbs, with scape-like stems, sheathing leaves, and perfect or monœcious flowers not on a spadix, furnished with both calyx and corolla; sepals and petals each 3, distinct; ovaries numerous, distinct, becoming akenes in fruit. — Roots fibrous; leaves radical, petiolate, strongly nerved with transverse veinlets, the earlier sometimes without blade; flowers in a loose raceme or panicle.

1. **Alisma.** Flowers perfect. Carpels verticillate, obovate-oblong, flattened.
2. **Sagittaria.** Flowers monœcious or diœcious. Carpels capitate, flattened and membranously winged.

1. ALISMA, L. Water-Plantain.

Petals small. Stamens 6, rarely more. Ovaries on a disk-like receptacle. Akenes in a crowded whorl, somewhat channelled on the back, obtuse. — Herbs in shallow water or mud, with small flowers in a verticillately branched panicle.

1. **A. Plantago,** L., var. **Americanum,** Gray. Leaves long-petioled, ovate, oblong, or lanceolate, pointed, mostly rounded or heart-shaped at the base, 3 to 9-nerved: carpels obliquely obovate, forming an obtusely triangular whorl in fruit. — From the base of the mountains eastward across the continent; also from California to Washington Territory.

2. SAGITTARIA, L. Arrow-head.

Staminate flowers above. Petals usually conspicuous. Stamens numerous, rarely few. Ovaries crowded in globose heads. Akenes abruptly beaked by the very short style. — Stoloniferous herbs with milky juice, broadly sheathing leaves often without a blade, and mostly simple stems bearing one to few whorls of flowers usually in threes.

1. **S. variabilis,** Engelm. Rootstock tuberiferous: scape ½ to 2 feet high or more, angled: leaves very variable, ovate-sagittate, or more or less narrowed, or even linear, acute, the similar lobes more or less divergent, acuminate: petals white, rounded, exceeding the sepals: fruiting heads nearly half an inch in diameter: akenes obovate, with a conspicuous acute horizontal beak at the upper angle. — From the mountains eastward across the continent; also from Nevada and California to British Columbia.

Order 86. **NAIADACEÆ.** (Pondweed Family.)

Marsh or mostly immersed aquatic herbs, with stems jointed and leafy (naked and scape-like in *Triglochin*), leaves sheathing at base or stipulate, and flowers perfect or unisexual, often spathaceous, with or without perianth; ovaries 1-celled, 1-ovuled.

* Immersed aquatics with flat leaves: ovaries 4, distinct. — NAIADEÆ.

1. **Zanichellia.** Flowers monœcious, axillary. Stamen 1, with slender filament. Fertile flowers solitary, with a cup-shaped membranous spathe or perianth. Ovaries nearly sessile, becoming more or less stipitate: stigmas peltate. Leaves opposite.
2. **Potamogeton.** Flowers perfect, with herbaceous 4-sepaled perianth, in a peduncled spike. Anthers 4, sessile. Ovaries sessile: stigma sessile, unilateral. Leaves mostly alternate.

* * Marsh plants with terete bladeless leaves: flowers perfect, spicate or racemose, with herbaceous 6-lobed perianth: carpels more or less united, separating at maturity. — JUNCAGINEÆ.

3. **Triglochin.** Ovaries 3 to 6, united until maturity. Leaves radical. Flowers bractless, in a spike-like raceme terminating a jointless scape.
4. **Scheuchzeria.** Ovaries 3, nearly distinct, at length divergent. Flowers bracteate in a loose raceme upon a leafy stem.

1. ZANICHELLIA, Micheli. HORNED PONDWEED.

Flowers sessile or nearly so. Male flowers of a single naked stamen. Fertile flowers usually in the same axils. Fruit an obliquely oblong beaked nutlet. — Very slender and branching, with very narrow and filiform leaves, not sheathing and with small stipules.

1. **Z. palustris,** L. Stems 2 inches to 2 feet long or more, leafy: leaves ½ to 3 inches long: fruit somewhat incurved, often more or less toothed on the back. — From New Mexico and S. Colorado northward, and in both the Pacific and Atlantic States. In fresh-water ponds and slow streams.

2. POTAMOGETON, Tourn. PONDWEED.

The four stamens opposite the perianth segments. Fruit somewhat compressed, ovate, drupe-like, with a crustaceous nutlet within. — Slender, jointed and branching, in fresh or brackish water, with linear or dilated leaves, and scarious stipules: spikes enclosed in the bud, at length long-exserted.[1]

* *Floating leaves more or less coriaceous, with a dilated petioled blade, different in form from the thinner submerged ones; stipules free: spikes cylindrical, mostly dense, not interrupted.*

+– *Submerged leaves reduced to narrowly grass-like or filiform sessile phyllodia.*

1. **P. natans,** L. Stem rather stout, simple or sparingly branched: floating leaves thick, ovate-elliptic to lanceolate, acutish, slightly cordate at base, 21 to 29-nerved, mostly shorter than the petiole; stipules long and conspicuous; upper submerged leaves with a small lanceolate blade, the lower (formed early or late in the season) reduced to phyllodia: peduncle stout, bearing an emersed spike: fruit turgid, obliquely obovate, acute: nutlet with a small deep pit on each side. — Across the continent, in ponds and ditches. In deeper or flowing water, the plant becomes more slender and often submerged.

+– +– *Submerged leaves lanceolate, rarely oval or linear.*

2. **P. rufescens,** Schrad. Floating leaves (often wanting) rather thin, 11 *to* 17*-nerved,* narrowly oblong-elliptic or oblanceolate, acutish, *attenuate into*

[1] Mature fruit is necessary for positive determination.

a very broad short petiole; submerged leaves as large as the floating ones, *sessile or nearly so, narrowly oblong-lanceolate,* obtuse or acute: spikes rather slender, on stout often elongated peduncles. *fruit round-obovate, acutely margined, beaked by the rather long style: nutlet pitted on each side.* — In Colorado and Montana, and common in the Atlantic States; also collected sparingly in California. In streams or ponds.

3. **P. lonchites,** Tuckerman. *Stem rather slender, branching:* floating leaves thickish, 11 *to* 23-*nerved,* long elliptical to oblong-lanceolate, acute or acutish, rather *abruptly narrowed into a petiole usually longer than the blade;* submerged leaves thinner and *longer, mostly linear-lanceolate, more attenuate at base,* the lower sessile: spikes on stout peduncles: *fruit obliquely obovate, carinate, acute: nutlet somewhat* 3-*keeled, the sides scarcely impressed.* — Am. Jour. Sci. II. vi. 226. From Mexico to the Atlantic States; also in the Pacific States. Usually in streams.

4. **P. amplifolius,** Tuckerman. *Stems often stout, simple:* floating leaves (sometimes wanting) 30 *to* 50-*nerved,* elliptic to oblong-lanceolate, acute, *mostly rounded or slightly cordate at base, on stout petioles about equalling the blade; submerged leaves often very large, mostly falcate and somewhat undulate,* acute, *attenuate to a usually short petiole:* spike thick, on a very stout peduncle: fruit large, 3-*keeled, with a broad stout beak: sides of the nutlet not pitted.* — Am. Jour. Sci. loc. cit. 225. — From New Mexico to the Atlantic States; also in California and Oregon. In ponds and streams.

5. **P. gramineus,** L. *Stems very slender, branching:* floating leaves rather thin, 9 *to* 15-*nerved,* small, oblong-elliptic, acutish, *rounded or cuneate at base, on slender petioles mostly equalling or exceeding the blade; submerged leaves linear-lanceolate,* variable in length, more commonly short, acute or acuminate, *narrowed at base:* spikes rather loose, on stout often elongated peduncles: *fruit round-obovate, acute, scarcely keeled.* — From the Yellowstone eastward; also in Nevada and California. In still or flowing water.

* * *Leaves all submerged and uniform, thin and dilated (lanceolate to oval), numerous, mostly sessile: spikes dense, on stout peduncles.*

6. **P. lucens,** L. *Stem stout,* branching: *leaves* usually large (2 to 6 inches long), *oblong-lanceolate or oblanceolate,* abruptly acute or acuminate, often undulate-serrate, *narrowed at base to a short petiole* or subsessile; *stipules large:* peduncles often elongated: fruit acute, slightly keeled. — From New Mexico to California; also eastward to Florida and New England.

7. **P. perfoliatus,** L. *Stem more slender,* flexuous, branching: *leaves broadly cordate to cordate-lanceolate,* ½ to 1½ inches long, obtuse or acute, *clasping at base; stipules small:* spikes somewhat compound, on mostly short peduncles: fruit obtusely keeled, beaked by the short slender style.

Var. (?) **lanceolatus,** Robbins. Leaves longer (2 to 4 inches or more), and more lanceolate, acuminate, undulate: peduncles thickened upward: fruit nearly orbicular. — Gray's Manual, 488.

* * * *Leaves all submerged and uniform, narrowly linear or setaceous, sessile.*
† *Stipules free from the narrow base of the leaf.*

8. **P. pusillus,** L. Stem filiform: leaves 1 or 2 inches long, rarely a line wide, often nearly setaceous, 1 to 5-nerved, biglandular at base: spikes capitate, or elongated, or interrupted, on slender flattened peduncles.

Var. **vulgaris,** Fries. Leaves 3-nerved, often obtuse, revolute and hence subulate. — From the Uintas to the N. Atlantic States and Canada.

+– +– *Stipules united with the sheathing base of the leaf: spikes interrupted.*

9. **P. pectinatus,** L. *Stem filiform,* repeatedly branched: *leaves very narrowly linear,* 2 to 6 inches long, rarely over ½ line broad, often setaceous, 1-*nerved, acute: peduncles elongated, slender:* fruit in often dense verticils, large (2 lines long), *obliquely obovate, obtusely keeled.* — From the Rocky Mountains eastward across the continent; also in the Pacific States.

10. **P. marinus,** L. Resembling narrow-leaved forms of the last, *low and very leafy: peduncles much elongated: fruit much smaller* (a line long) and thinner, *round obovate, not keeled upon the rounded back,* tipped with the broad sessile stigma.

Var. (?) **occidentalis,** Robbins. Often *taller and less leafy: peduncles usually rather short:* spikes interrupted. — Bot. King Exped. 339. Colorado, Utah, Montana, and westward.

11. **P. Robbinsii,** Oakes. *Stem rather stout,* often branched and flexuous: *leaves numerous, distichous, the close sheaths nearly covering the stem, linear-lanceolate,* 2 to 3 inches long by 2 lines broad, *many-nerved, acuminate, ciliate-serrulate: spikes usually several, on rather stout pedicels: fruit oblong-obovate,* nearly 2 lines long, *keeled with a broadish wing,* acutely beaked. — Gray's Manual, 490. From Oregon to the Yellowstone, and common in the N. Atlantic States.

3. TRIGLOCHIN, L. Arrow-grass.

Stamens 3 or 6: anthers nearly sessile. Ovary with sessile stigmas and solitary ovules, separating at maturity from the central axis into as many distinct pods. — Herb with fibrous roots.

1. **T. maritimum,** L. *Rather stout,* a span to 2 or 3 feet high: leaves shorter than the scape, *a line or two broad:* raceme usually crowded, 4 to 12 inches long: *flowers a line broad: fruit obtuse at base,* 6-*carpelled,* 1½ *to* 2½ *lines long, and about equalling the pedicels.* — In saline places across the continent.

2. **T. palustre,** L. *Slender,* ½ to 1½ feet high: *leaves less than a line broad: flowers smaller: fruit attenuate at base,* 3-*carpelled,* 2½ *to* 4 *lines long, exceeding the pedicels,* separating from below upward. — From the Rocky Mountains eastward across the continent.

4. SCHEUCHZERIA, L.

Stamens 6: anthers on slender exserted filaments. Ovary of 3 nearly distinct carpels, becoming divergent coriaceous sub-globose pods: stigmas flat and sessile. — Herb with a creeping jointed scariously sheathed rootstock.

1. **S. palustris,** L. Stems a span high or less: leaves exceeding them, pitted at the tip: raceme 4 to 6-flowered, with sheathing bracts, the upper ones small. — From the Rocky Mountains eastward across the continent; also in California and Washington Territory.

Order 87. **CYPERACEÆ.** (Sedge Family.)

Grass-like or rush-like herbs, with fibrous roots, mostly solid stems, closed sheaths, and spiked chiefly 3-androus flowers, one in the axil of each of the glume-like imbricated bracts, destitute of any perianth, or with hypogynous bristles or scales in its place, the 1-celled ovary in fruit forming an akene. Style 2 or 3-cleft. Stem leaves when present 3-ranked.

* Flowers all perfect: spikelets few to many-flowered, solitary or spicate, the spikes capitate or umbellate: only 1 or 2 of the lower scales usually empty. — Scirpineæ.

+– Spikelets more or less flattened, the scales being in 2 ranks: inflorescence involucrate. — Cypereæ.

1. **Cyperus.** Perianth (bristles, etc.) none. Style slender, deciduous. Spikelets spicate or clustered. Stamens 1 to 3.

+– +– Spikelets many-flowered, not flattened, the scales imbricated all around. — Scirpeæ.

++ Style not dilated at base.

2. **Scirpus.** Spikelets solitary or clustered or in a compound umbel, the stem often leafy at base and inflorescence involucrate. Style deciduous or only the base persistent. Barbed bristles present at the base of the akene or wanting. Stamens mostly 3.

3. **Eriophorum.** Like the last, but the numerous naked bristles long-exserted and silky in fruit. Spikelets few. Stamens 1 to 3.

4. **Hemicarpha.** Like *Scirpus*, but without bristles and with a minute hyaline bractlet between each flower and the rhachis. Spikelets solitary or few in a sessile apparently lateral cluster. Stamen 1.

++ ++ Style enlarged at base.

5. **Eleocharis.** Spikelet solitary, terminal upon a leafless bractless stem. Base of the style persistent. Bristles usually present. Stamens 3.

6. **Fimbristylis.** Spikelets in an involucrate umbel. Stem leafy at base. Style usually wholly deciduous. Bristles none. Stamens 1 to 3.

* * Flowers monœcious; the staminate and pistillate in the same spike, which is terminal (in ours): akene naked, without bristles. — Sclerineæ.

7. **Kobresia.** Spikelets sessile in a terminal spike, with a glume-like bract under each spikelet. Stem leafy at base. Base of the style persistent. Stamens 3.

* * * Flowers monœcious, in the same or distinct spikelets, or dicœcious: akene enclosed in an inflated sac-like persistent perigynium. — Caricineæ.

8. **Carex.** Spikelets solitary, spicate or paniculate. Hypogynous bristles or scales wholly wanting or a single short bristle at the base of the ovary.

1. CYPERUS, L. Galingale.

Scales concave or keeled, often decurrent upon the rhachis. Akene lenticular or triangular, not beaked, usually smooth. — With mostly triangular and nearly naked simple stems, sheathed at base by the nearly radical leaves: inflorescence subtended by a mostly conspicuous leafy involucre, usually irregularly umbellate with unequal rays, the spikelets in spikes solitary or clustered upon the rays, the central spike or cluster always sessile, and the whole often contracted into a single more or less dense head. Ours all belong to Eucyperus, in which the style is 3-cleft and akene triangular, the spikelets many-flowered, with carinate scales, and with the rhachis naked or nearly so.

* *Stamen* 1: *spikes short and small, collected in globular heads, ovate or linear-oblong, compactly many-flowered: low annuals, with a* 2 *to* 3*-leaved involucre.*

1. **C. aristatus,** Rottb. Spikes oblong becoming linear, 7 to 13-flowered, in 1 to 5 ovate heads: scales nerved, tapering into a long recurved point: akene obovate, obtuse. — *C. inflexus,* Muhl. Said to be sweet-scented in drying. Across the continent.

* * *Stamens* 3: *spikes loosely or somewhat remotely* 6 *to* 12*-flowered, flattish and greenish, several crowded together in one sessile or in a few peduncled heads or dense clusters: scales convex on the back, many-nerved, a little longer than the sharply triangular akene: perennials, with hard clustered corms or bulb-like tubers at the base of the stems.*

2. **C. Schweinitzii,** Torr. *Stem rough on the angles,* 1 to 2 feet high: leaves linear: *umbel simple,* 4 *to* 8*-rayed:* spikes crowded along the upper part of the mostly elongated rays, erect: *scales awl-pointed: joints of the axis narrowly-winged.* — In dry sandy places in Colorado; also from Lake Ontario northwestward.

3. **C. filiculmis,** Vahl. *Stem slender, wiry, often reclined:* leaves linear: *spikes numerous and clustered in one sessile dense head, or in* 1 *to* 7 *additional looser heads on spreading rays* of an irregular umbel: *joints of the axis naked: scales blunt, greenish.* — In dry soil, and coming into our range from W. Kansas.

2. SCIRPUS, L. Bulrush or Club-Rush.

Hypogynous bristles 3 to 6, barbed or ciliate, or wanting. Style 2 to 3-cleft. Akene lenticular or more or less triangular, obovoid. — Tufted plants, with creeping rootstocks, the stem sheathed or leafy at base, and the spikelets in an apparently lateral cluster, or compound umbel-like panicle, or solitary.

* *Bristles when present rigid, not elongated and contorted or exserted after flowering, barbed downwards or smooth.*

+ *Spike solitary, few-flowered, small, often flattish: akene triangular, smooth.*

1. **S. cæspitosus,** L. Stems terete, filiform, in compact turfy tufts, densely sheathed at the base, the upper sheath bearing a very short awl-shaped leaf: scales of the ovoid spike rust-colored: involucral bract a rigid-pointed scale, resembling the lowest proper scale of the spike: bristles 6, smooth, longer than the abruptly short-pointed akene. — Mountains of Colorado (*Hall* and *Harbour*); also from the mountains of New England and N. Carolina northwestward.

+ + *Spikes clustered* (*rarely only one*), *appearing lateral from the one-leaved involucre, which resembles the naked stem, seeming to be a continuation of it.*

++ *Stem sharply triangular, stout: sheaths at base more or less leaf-bearing: spikes rusty brown, closely sessile in one cluster.*

2. **S. pungens,** Vahl. *Stem sharply* 3*-angled throughout,* 1 to 4 feet high, *with concave sides: leaves* 1 *to* 3 *elongated:* spikes 1 to 6, capitate, usually long overtopped by the pointed involucral leaf: *scales ovate, sparingly ciliate,* 2-cleft at the apex and awl-pointed from between the acute lobes: *anthers tipped with an awl-shaped minutely fringed appendage.* — Borders of ponds and streams from California into Mexico, and northward; common in the Atlantic States.

3. **S. Olneyi,** Gray. *Stem 3-wing-angled, with deeply excavated sides,* 2 to 7 feet high, the upper sheath bearing *a short triangular leaf or none:* spikes 6 to 12, closely capitate, overtopped by the short involucral leaf: *scales orbicular, smooth,* mucronate-pointed: *anthers with a very short and blunt minutely bearded tip.* — Pl. Lindh. 30. Across the southern part of the continent and northward along the Atlantic seaboard.

↔ ↔ *Stem terete, very tall and stout, naked: sheaths at the base bearing a short and imperfect leaf or none: spikes rusty or chestnut-brown, numerous and clustered in a one-sided compound umbel-like panicle, the principal rays of which mostly surpass the involucral leaf: scales with a salient midrib extending into a mucronate point.*

4. **S. lacustris,** L. Stem 3 to 9 feet high, scales ciliate: akene pale and dull, obovate with a narrowed base, usually overtopped by the 4 to 6 slender downwardly barbed bristles. — *S. validus,* Vahl. Common in fresh-water ponds throughout the Atlantic States, and extending westward to the mountains.

Var. **occidentalis,** Watson. Scales often pubescent, especially on the midvein, usually pale with fine brown lines: bristles not exserted: akene broadly obovate, terminating abruptly in a rather short beak: — Bot. Calif. ii. 218. From Texas and Colorado to British Columbia and the Pacific coast. Known as "Tule."

↔ ↔ ↔ *Spikes clustered in simple or mostly compound umbellate or cymose-panicled clusters, many-flowered, terete: involucre of mostly several obvious and flat leaves: stems tall, triangular, leafy.*

↔ *Spikes large: midrib of the scales extended beyond the mostly lacerate or* 2*-cleft apex into a distinct awn.*

5. **S. maritimus,** L. Leaves flat, linear, as long as the stout stem (1 to 3 feet high), those of the involucre 1 to 4, very unequal: spikes few to several in a sessile cluster, often also with 1 to 4 unequal rays: awns of the scale soon recurved: *akene obovate-orbicular, compressed, flat on one side, convex or obtuse-angled on the other, minutely pointed, shining, longer than the bristles.* — In salt marshes everywhere across the continent.

6. **S. fluviatilis,** Gray. Stem stouter and taller: leaves flat, broadly linear, the upper and those of the very long involucre much exceeding the *compound umbel: rays* 5 *to* 9, *elongated, recurved-spreading:* scales less lacerate and their awns less recurved: *akene obovate, sharply and exactly triangular, conspicuously pointed, dull, scarcely equalling the bristles.* — Borders of lakes and streams from W. Vermont to Illinois and Wisconsin, and extending into our range at its northeastern border.

↔ ↔ *Spikes very numerous, small: scales mucronate-pointed or blunt: umbel-like cymose panicle irregular, compound or decompound: stem tall and very leafy: bristles very slender and often more or less tortuous and naked below.*

7. **S. sylvaticus,** L. Spikes lead-colored, 3 *to* 10 *in a cluster at the end of the mostly slender ultimate divisions of the open decompound panicle: scales bluntish: bristles* 6 and *downwardly barbed throughout:* akene angled on the back, short-pointed: style 3-cleft.

Var. **digynus,** Boeck. *Style 2-cleft, akene not at all angled on the back,* stamens 2, and bristles 4. — *S. microcarpus,* Presl, of Gray's Manual. From California to Colorado and across the continent northward. The type is rarely collected in New England.

8. **S. atrovirens,** Muhl. Very similar to the last: *panicle more contracted,* the smaller spikelets crowded in denser and larger clusters: *scales* narrower and *narrowly acuminate: bristles scarcely barbed below the middle: style 3-cleft:* akene oblong-obovate, *more acuminate, slightly angled on the back.* — In wet meadows and bogs from Colorado to California and Oregon, and eastward to New England.

* * *Bristles capillary, naked, not barbed, elongating, becoming tortuous and entangled, much longer than the triangular akene.*

9. **S. lineatus,** Michx. Stem triangular, leafy, 1 to 3 feet high: leaves linear, flat: umbels terminal and sometimes axillary, loose, drooping, the terminal with a 1 to 3-leaved involucre much shorter than the long slender rays: spikes oblong, becoming cylindrical, on filiform drooping pedicels: bristles at maturity scarcely exceeding the green-keeled and pointed scales: akene sharp-pointed. — From New England to Wisconsin and southward, coming into our range from W. Kansas.

3. ERIOPHORUM, L. Cotton-Grass.

Distinguished from *Scirpus* chiefly by very numerous naked silky bristles which become long-exserted in fruit. Style very slender and elongated, 3-cleft. Akene acutely triangular. — Perennials with creeping rootstocks.

1. **E. gracile,** Koch. Stem very slender, 1 or 2 feet high: *leaves slender, channelled-triangular: involucre of 1 to 3 brownish scales: spikelets 2 to 5 on short tomentose-scabrous* slightly nodding rays: *akene linear-oblong,* broadest above. — Cold bogs across the continent in the northern tier of States.

2. **E. polystachyum,** L. Stouter: *leaves linear, flat or barely channelled below: involucre more conspicuous, 2 or 3-leaved: spikelets more numerous* and larger, upon longer nodding *usually smooth rays: akene broader,* obovate. — From Colorado northward, and thence eastward across the continent; also in Oregon.

4. HEMICARPHA, Nees.

Distinguished from *Scirpus* chiefly by the minute hyaline bractlet between the flower and the axis. Style 2-cleft. — Low setaceous annuals, with flattened stems, somewhat leafy at base.

1. **H. subsquarrosa,** Nees. Stems numerous, tufted, 1 to 6 inches high, brown-sheathed at base, with 1 or 2 very short filiform leaves: principal involucral bract continuous with the stem, the others much smaller or none: scales brown, tipped with a short recurved point. — From California to New Mexico and Colorado and eastward through the Atlantic States.

5. ELEOCHARIS, R. Brown. Spike-Rush.

Scales closely imbricated all around the rhachis. Perianth of 3 to 9 short retrorsely barbed bristles, rarely none. Style usually 3-cleft, the conical or

flattened tuberculate base persistent and mostly jointed upon the summit of the turgid-triangular or lenticular akene. — Stems tufted, from matted or creeping rootstocks, terete or angular, the base covered with closely appressed sheaths: lower scale of the spikelet sometimes enlarged and bract-like.

* *Spike small and few flowered, the scales somewhat distichous or only* 3*-ranked: style* 3*-cleft and akene triangular.*

+– *Tubercle contracted at its junction with the akene.*

1. **E. acicularis,** R. Br. Stems with fibrous roots and very slender running rootstocks, usually setaceous, 1 to 8 inches high: spike 3 to 9-flowered: scales acutish, more or less deeply tinged with brown: bristles 3 or 4, often wanting: akene oblong-obovate, obscurely triangular and faintly ribbed on the sides; tubercle broad, short and blunt. — On sandy or muddy stream-banks across the continent.

+– +– *Tubercle continuous with the akene and not contracted at base.*

2. **E. pauciflora,** Watson. Stems from slender running rootstocks, 3 to 8 inches high, striate: spike ovate-oblong: scales acute, dark brown: bristles 3 to 6, usually equalling the akene: akene oblong-obovate, obtusely triangular; tubercle rather stout, pyramidal, nearly a third as long as the akene. — Bot. Calif. ii. 221. *Scirpus pauciflorus,* Lightfoot, Gray's Manual, 560. From Colorado and Wyoming to the N. Atlantic States; also in California.

* * *Spike terete, many-flowered: tubercle somewhat contracted at its junction with the akene: style* 2*-cleft and akene lenticular.*

3. **E. palustris,** R. Br. Stems usually slender, terete, striate, ½ to 4 feet high: *spike oblong-lanceolate to linear, acute,* 3 to 12 lines long: *scales obtuse* or the upper acutish, thin, *brown with white margin* and greenish keel: *bristles* 4, *about equalling the akene: akene obovate, turgid, smooth; tubercle broad-deltoid, acutish or acute,* rarely acuminate. — Throughout the continent, and in most parts of the Old World.

4. **E. olivacea,** Torr. Stems very slender and spreading, 1 to 6 inches high: *spike ovate or oblong-ovate,* 1 to 3 lines long: *scales obtuse, rather loosely imbricated,* purple with a green midrib: *bristles* 6 *or* 8, *longer than the akene:* akene and tubercle as in the last. — Colorado, Montana, and Oregon; also on the Great Lakes and the Atlantic coast.

5. **E. compressa,** Sulliv. *Stem flat,* striate, 1 to 2 feet high: *spike ovate oblong,* at length lanceolate, 4 to 7 lines long: *scales acute, dark purple with broad white pellucid margins: bristles* 1 *to* 4 (or none), *very slender* and fragile, *shorter than or equalling the akene; akene obovate-pear-shaped, compressed; tubercle small, conical, pointed.* — Gray's Manual, 558.

6. FIMBRISTYLIS, Vahl.

Scales closely imbricated around the rhachis. Styles 2 to 3-cleft, often flattened and ciliate, somewhat dilated at base. Akene lenticular or triangular, usually attenuate at base or substipitate. — In ours the style is 2-cleft and the akene lenticular.

1. **F. spadicea,** Vahl. Stems 1 to 2½ feet high, from a *perennial root, rigid, as are the filiform convolute-channelled leaves:* spikes ovate-oblong, becom-

ing cylindrical: *stamens* 2 *or* 3: *akene very minutely striate and obscurely reticulated.* — Colorado to Indian Territory and Texas; also along the Atlantic coast.

7. KOBRESIA, Willd.

Lowest glume enclosing an ovary with a long trifid style; the next one, or rarely the next two, enclosing 3 stamens; often a rudimentary glume or awn terminating the rhachis; occasionally but one glume to a spikelet. — Perennial herbs with filiform leaves, radical or sheathing the stems at base.

1. **K. scirpina,** Willd. Stems cespitose, 5 to 12 inches high, striate-angled: leaves shorter than the stem: spikelets few, small, and brown, in a somewhat clavate spike one inch long. — *Elyna spicata,* Schrad. South Park, Colorado (*Hall & Harbour*).

8. CAREX, L. Sedge. (By L. H. Bailey, Jr.)

Flowers in spikes, imperfect, the staminate and pistillate in different parts of the same spike (spike *androgynous*), or in separate spikes on the same culm (plant *monœcious*), or rarely on entirely distinct plants (plants *diœcious*). Staminate flower composed of 3 stamens borne beneath a bract or *scale.* Pistillate flower composed of a single pistil bearing 2 or 3 exserted styles, forming in fruit a lenticular or triangular achenium which is enclosed in a more or less inflated sac (*perigynium*) borne in the axil of a scale. — Perennial grass-like herbs with 3-ranked leaves, mostly triangular culms, and spikes in the axils or exserted from the sheaths of leaf-like or scale-like bracts. Theoretically each flower is entirely destitute of floral envelopes, and borne on a branch which springs from the axil of a scarious bract (the *scale* of the following descriptions), the enclosing perigynium of the fertile flowers answering to one (or two) connate bractlet. The term *fruit* as applied to the perigynium and its contents is a misnomer. In the subgenus *Vignea* of the present elaboration the spikelets or spiculæ of authors are called *spikes,* which they truly are, and they are conglomerated into *heads.* The genus is an exceedingly critical one and its study should not be attempted with unripe or imperfect specimens.

Artificial Key.

I. Spike one, terminal, strictly simple, staminate at the top, or in diœcious plants (5 & 46) all staminate or all pistillate.

Stigmas three.
Perigynium spindle-shaped or lanceolate,
Green 1
Dark brown or purple 2, 3
Perigynium short, mostly ovate or elliptic,
Perfectly smooth.
Perigynia 1 to 3, conspicuously spreading, or remote from the staminate portion,
Obovate, obtuse 10
Elliptic, sharply beaked 16
Perigynia several, continuous with the staminate portion.
Scales leaf-like 11
Scales short, ciliate 46
Scales short, entire,

Very broad, covering the perigynium.
Leaves short, stiff, involute 15
Leaves ordinary 14
Narrower, shorter than perigynium 17
Scabrous or hairy.
Perigynia 1 to 4, scabrous above 4
Perigynia several to many, hairy 5
Stigmas two 52, 53

II. Spikes all aggregated into a round or ovoid uninterrupted head, stigmas two.

Spikes densely packed, the individual ones scarcely discernible.
Head black . . . . . 50 var. *nigra*.
Head tawny or brown,
Subtended by 1 or 2 long leafy bracts 80
Naked or nearly so.
Perigynium nearly orbicular, dark 70
Perigynium ovate or lanceolate.
Spikes staminate at base 78, 79
Spikes staminate at top.
Perigynium rough-angled 58, 59
Perigynium smooth 60, 61, 62
Head green 58
Spikes simply aggregated, the individual ones readily recognized.
Spikes nearly linear, light colored 71
Spikes oval or ovoid.
Perigynium wing-margined,
Broadly ovate or oval 84, 87
Lanceolate 82, 83, 85
Perigynium wingless,
Nerved, beak longer than the body 64
Nerved, beak short 57
Nerveless.
Heads small globular 62
Heads oblong 76

III. Some or all the spikes distinct.

Terminal spike staminate above (staminate flowers inconspicuous), spikes often all approximated into an interrupted head or panicle, stigmas always two.
Spikes conspicuously panicled . . . . . 65, 64 (sometimes).
Spikes not panicled.
Perigynium strongly nerved.
Culm flat 63
Culm broadly 3-angled 64
Culm nearly terete 57
Perigynium nerveless or nearly so.
Spikes 1 to 3-flowered, scattered; perigynium erect; plants delicate . . 54
Spikes 5 to many-flowered; perigynium divaricate or reflexed.
Spikes all distinct 55
Upper spikes aggregated 66
Spikes 5 to 12-flowered; perigynium nearly upright 59
Terminal spike staminate below.
Stigmas two.
Spikes very dark.
Scales long and sharp 49
Scales ordinary 50, 51
Spikes tawny or whitish.
Perigynium lanceolate.
Thin and scale-like 81, 82, 83

More or less thick and rounded.
Heads fulvous 85
Heads silvery or silvery-tawny 72, 73, 74
Perigynium ovate, wing-margined 86, 87
Perigynium ovate, not margined 75, 76, 77
Perigynium broadly obovate, nearly pointless 22
Stigmas three.
Pistillate spikes nodding 25
Pistillate spikes erect 23, 24
Intermediate spikes of the silvery or tawny interrupted head staminate, stigmas two.
Perigynium short and broad, dark-colored 68
Perigynium ovate or ovate-lanceolate, straw-colored 67, 69
Perigynium long-lanceolate, silvery-green 72
Terminal spike or spikes entirely staminate.
Stigmas two.
Perigynium strongly nerved.
Plant stout 40
Plant very slender . . . . . 45 var. *juncella*.
Perigynium nerveless or nearly so.
Bracts all leaf-like,
Scales ciliate at top 41
Scales not ciliate 42
Bracts not conspicuously leafy.
Spikes rounded or oval.
Staminate spike short-stalked . . . . . 35, 45 var. 2
Staminate spike sessile 47, 50
Spikes oblong or long-cylindrical.
Perigynium ovate, green or brown-purple 43, 44, 45
Perigynium obovate, yellow or whitish 20
Stigmas three.
Perigynium hairy.
Pistillate spikes few-flowered, almost globular, mostly sessile.
Scales ciliate 5
Scales not ciliate.
Spikes greenish; culms slender 7, 8
Spikes greenish or whitish; culms very short 8, 9
Spikes colored 6
Pistillate spikes few-flowered, linear; plant delicate 12
Pistillate spikes several to many-flowered, oblong or cylindrical.
Perigynium conspicuously nerved 32
Perigynium nerveless or nearly so.
Plant hairy throughout 13
Plant smooth 30
Perigynium smooth.
Pistillate spikes pendulous or nodding.
Beak slender, longer than body of perigynium; spikes greenish-white . 29
Body of perigynium as long or longer than beak.
Spikes small, 6 or less-flowered; plant delicate 27
Spikes nearly globular, pendulous, very dark 48
Spikes very loosely-flowered, long-linear 26
Spikes thick and long; perigynium inflated,
Greenish straw-colored, slender-beaked, conspicuously more than 10-nerved 34
Straw-colored or often purplish,
More or less ascending 36, 37
Conspicuously squarrose 38, 39
Spikes all erect,
Short-oblong or round, densely-flowered, approximate.
Beak short, bifid 31

Beak short, stout, truncate 18
Beak longer than body 29
Spikes cylindrical.
Perigynium beakless 19
Perigynium nearly beakless, the point bent 21
Perigynium conspicuously beaked,
Lanceolate, flattened 28
Greenish, very turgid below, large 33
Brown and hard, with spreading setaceous teeth . . . . . 32 var.
Thin, inflated, straw-colored or purple,
More or less ascending 36, 37
Conspicuously squarrose 38, 39

Subgenus I. **Eucarex.** Staminate flowers forming one or more terminal linear or club-shaped spikes which are often pistillate at base or apex, or occasionally having a few pistillate flowers intermixed. Pistillate flowers usually in distinct and normally simple mostly peduncled spikes which are seldom aggregated into heads. Cross-section of the perigynium circular or obtusely angular in outline. Style commonly 3-parted and the achenium trigonous or triquetrous. — Passing into the following subgenus through the members of the last section.

§ 1. *Spike single* (in our species), *androgynous, male at the top, the rhachis conspicuously jointed: perigynium lanceolate or spindle-shaped, longer than the scale, deflexed at maturity: stigmas very rarely two.* — Deflexocarpæ. Low and mostly slender species.

* *Perigynium green, linear-lanceolate, sessile, several times longer than the scale.* — Paucifloræ, Tuckm.

1. **C. microglochin,** Wahl. Culms rigid from a creeping base, 2 to 8 inches high: leaves few and narrow, shorter than the culm: staminate flowers very few: perigynia 4 to 6, the orifice closed by a conspicuous projecting racheola which springs from the inside beneath the achenium: scales deciduous. — *Uncinia microglochin,* Ledeb. Colorado, probably from high mountains (*Hall & Harbour,* 607); also in subarctic America. (Eu.)

C. pauciflora, Lightf., distinguished by the orifice of the perigynium being closed with the stiff persistent style, occurs in British America and may be expected northward.

* * *Perigynium brown, spindle-shaped or narrowly ovate, stipitate, little longer than the scale.* — Publicares, Tuckm.

2. **C. Pyrenaica,** Wahl. Culm 2 to 8 inches high, *slender:* spike dense, oblong, brown or purple, the fertile flowers erect until full maturity: *leaves narrow, mostly involute-filiform,* shorter than the culms: *staminate flowers few, occupying ⅓ or less the length of the spike:* perigynium few-nerved or nerveless, usually shining at maturity. — High mountains of Colorado, Utah, and northward. (Eu.)

3. **C. nigricans,** C. A. Meyer. *Stouter: leaves nearly flat, a line or more broad: staminate flowers usually conspicuous and occupying about half the spike:* perigynium somewhat ventricose, dull: otherwise as in the last, with which it grows. — Evidently the more common species. (Asia.)

§ 2. *Spikes one or more: staminate spike always single, usually distinct, sessile or nearly so, sometimes androgynous with all the pistillate flowers borne at its base: pistillate spikes, if any, small and globular, mostly sessile, more or less approximate: bracts short or none, sheathless: perigynium ovate or globular, hirsute* (thin and scabrous in No. 4), *tightly surrounding the achenium, usually bearing a beak half its length: pistillate scales acute* (except in Nos. 4 and 5): *stigmas rarely* 2. — SPHÆRIDIOPHORÆ, Drejer. Low species in dry places, the leaves all radical. No. 5 is dioecious.

* *Spike one, androgynous.* — FILIFOLIÆ, Tuckm.

4. **C. filifolia,** Nutt. *Cespitose:* culms slender, obtusely angled and smooth, 3 to 12 inches high, when full grown longer than the *filiform rigid leaves,* their bases surrounded by dry brown leafless sheaths which at length break up into fibres: spike ¼ to 1 inch long, *ferruginous or whitish, bractless,* the staminate portion sometimes nearly free from the pistillate portion: *perigynium broadly triangular-obovoid, thin, few-nerved or nerveless, scabrous or slightly hairy above, abruptly contracted into a short, stout, white-hyaline entire beak, about the length or shorter than the very broad hyaline-margined clasping scale:* perigynium containing a short serrate racheola, whence the name *Uncinia breviseta,* Torr. — Dry plains and mountains from Colorado westward and northward.

Var. **valida,** Olney. *Culm very stout,* a foot high, *rigid, sharply angled, much longer than the long-pointed broader leaves: spike longer, often subtended by a hispid bract:* perigynium more glabrous. — *C. filifolia,* var., Boott in Gray's Rocky Mountain Plants, 77. Colorado.

5. **C. scirpoidea,** Michx. *Creeping:* culms in flower short, *elongating* (6 to 16 inches high) *in fruit and exceeding the broad and flat leaves,* more or less scabrous on the angles at least above, the basal sheaths not splitting into fibres: spike ferruginous, *linear or club-shaped,* ½ to 2 inches long, occasionally with 1 or 2 accessory spikes at base: *perigynium ovate or obovate, hairy, lightly nerved, about the length* (or a little longer) *of the ciliate more or less obtuse scale:* scales on the staminate plant hyaline-margined, not ciliate. — *C. Wormskioldiana,* Hornem. High mountains, Colorado and Utah, northward and westward. (Asia, Norway.)

* * *Spikes two to several, the lower occasionally peduncled or sometimes radical: perigynium contracted below, usually bearing two prominent ribs, the very short or often prolonged beak slightly* 2-*toothed.* — MONTANÆ, Fries (in part).

+ *Culms upright, as long or longer than the leaves: spikes closely flowered, mostly aggregated at the top of the culm.*

6. **C. Pennsylvanica,** Lam. *Extensively creeping: culms few,* slender, 4 to 10 inches high: *staminate spike conspicuous,* ½ to 1 inch long, *often club-shaped,* sessile or shortly peduncled, sometimes pistillate at the top: pistillate spikes 1 to 4, the lower one very rarely an inch remote, *the upper ones bractless, the lower sometimes subtended by a short and subulate brown bract:* perigynium globose or roundish-obovoid, abruptly contracted into a short or often long beak, *usually shorter than the acute or cuspidate brown or rarely whitish scale.* — *C. leucorum,* Willd., is a form with long beaks. Dry sandy plains about Denver (*E. L. Greene*), Ute Pass, Col. (*T. C. Porter*); Fort Pierre,

Dak., and probably generally distributed northward. A variable species; spikes usually brown or dark purple, sometimes whitish, the pistillate varying in size from an inch long to very small and almost abortive. A form with rigid leaves, a single whitish pistillate spike with large perigynia and borne at the base of the staminate spike, has considerable resemblance to forms of *C. filifolia*. Radical spikes sometimes occur.

7. **C. Emmonsii,** Dew. *Densely cespitose: culms many, very slender,* about equalling the *narrow soft leaves: staminate spike very small,* 1 to 4 lines long, *often nearly concealed by the pistillate spikes, which are* 2 *to* 5, *small,* 3 to 9-flowered, *green,* the lower usually short-bracted, *very closely aggregated at the top of the culm,* occasionally 1 or 2 of the lower a little remote or rarely on a radical peduncle: *perigynium small,* narrowly oval or ovate and more or less 3-sided, with a conspicuous more or less toothed beak. — *C. Novæ-Angliæ,* var. *Emmonsii,* Carey. Indian Territory (*Geo. D. Butler*) and southward. Readily distinguished by its closely aggregated green spikes.

+– +– *Culms mostly shorter than the leaves: spikes looser flowered and more scattered, often radical.*

8. **C. Novæ-Angliæ,** Schw., var. **Rossii,** Bailey. *Culms few,* 3 to 6 inches high, *nearly or about the length of the narrow and straight leaves: pistillate spikes few,* 1 *to* 4-*flowered, linear and upright, light colored: perigynia loosely alternate on a zigzag rhachis,* ovoid, the flattened mostly cut-toothed beak either longer or shorter than the body. — *C. Rossii,* Boott. Frequent from New Mexico (*Fendler,* 889) to the mountains of Colorado and Utah; also in British Columbia. The species occurs in Washington Territory and northward and eastward in British America. It is distinguished by a weaker habit, and darker colored and more aggregated spikes.

9. **C. umbellata,** Schk. *Rootstock stout, mostly horizontal: culms many, mostly very short and crowded and concealed among the leaves,* sometimes 3 to 4 inches long: *leaves many, generally short, stiff and curved,* sometimes weak and straggling and 6 inches long: *staminate spike* ½ *inch or less long, not usually distinct and conspicuous: pistillate spike usually crowded among the bases of the leaves,* sometimes one or more of them exserted and clustered with the staminate spike: perigynium globose-elliptic, more or less flattened, *produced into a flattened toothed beak as long as the body.* — Indian Territory; and common eastward.

Var. **brevirostris,** Boott. Beak much shorter and minutely toothed, the perigynium rounder or somewhat 3-sided. — Mogollon Mountains, New Mexico, and near Golden City, Colorado (*E. L. Greene*); also in California and British America.

§ 3. *Spikes androgynous, staminate above: pistillate flowers few, often remote, usually on a more or less zigzag rhachis: scales prolonged and leaf-like* (scarious and often short in No. 10): *perigynium smooth, or slightly hispid above, mostly tightly enclosing the achenium, the beak, if any, straight.* — PHYLLOSTACHYS,[1] Carey.

[1] A peculiar section, including one Caucasian and five American species which fall into two well-marked groups. The section is connected with the *Montanæ* through the *Bracteatæ*, and with the Old World *Depauperatæ*, and through that group with the *Laxifloræ*, by *C. Geyeri*.

* *Culms all as long or nearly as long as the leaves: staminate flowers conspicuous: pistillate flowers very few and large: beak very short.* — PHYLLOSTACHYÆ, Bailey.

10. **C. Geyeri,** Boott. Stoloniferous: culms very slender, angled, rough, about a foot high, about the length of the flat rough-edged leaves: staminate portion of the spike usually appearing distinct, ½ to 1 inch long: pistillate flowers 1 or 2, large, erect with the rhachis: perigynium triangular-obovoid, 3 lines long, the conspicuous angles obtuse, one-nerved on the two inner sides, very smooth, with a very short entire erose and hyaline beak: scales thin and brown, acute, 2 to 4 times the length of the perigynium. — Mountains of Colorado, Utah, and Montana. Hitherto confounded with *C. multicaulis*, Bailey, a Californian and Oregon species with numerous prolonged stiff terete and smooth culms.

* * *Culms mostly much shorter than the leaves: staminate flowers inconspicuous: perigynium small, the beak produced to half its length (or more): scales very green and much dilated, often concealing the perigynia, and readily mistaken for bracts.* — BRACTOIDEÆ, Bailey.

11. **C. Backii,** Boott. Cespitose: culms 1 to 7 inches high, sharply angled: leaves lax and smooth: staminate portion of the spike about 3-flowered: pistillate flowers 2 to 4, aggregated, more or less spreading: perigynium globose-ovate, inconspicuously nerved, smooth or very slightly scabrous above: lower scales longer than the culm. — Dry and rocky hills, Colorado (*Hall* and *Harbour*), and British America.

§ 4. *Staminate and pistillate spikes distinct: staminate spike single, more or less peduncled: pistillate spikes more or less elongated and peduncled, loosely alternate-flowered* (except in *C. Richardsoni* and No. 13): *bracts always sheathed* (except in No. 13), *the sheaths sometimes membranaceous and leafless: perigynium 3-angled or globular, tightly enclosing the achenium, faintly nerved or nerveless, more or less hairy in the less evolved species, smooth and the short beak curved in the Laxifloræ.* — DACTYLOSTACHYÆ, Drejer (in part). Mostly low or undersized species, with a loose habit, growing in dry or grassy places.

* *Sheaths membranaceous or hyaline, either not prolonged into a bract or the bract very short and not foliaceous: perigynium more or less 3-angled, hairy in our species and the beak straight.* — DIGITATÆ, Fries.

C. RICHARDSONI, R. Br., connecting this section with § 2, is distinguished from *C. Pennsylvanica*, which it strongly resembles, by its peduncled spikes and dark purple leafless sheaths. It occurs in the Eastern States, British America, and California, and may be expected in Montana.

12. **C. concinna,** R. Br. *Stoloniferous:* culms slender, 2 to 6 inches high, longer than the sharp-pointed leaves: staminate spike *small, shortly stalked,* its scales obtuse, rarely bearing 1 or 2 pistillate flowers at the top: pistillate spikes 2 *to* 5, *short, rather loosely* 2 *to* 8-*flowered,* at least the lower ones *distinctly peduncled* (the peduncles often included in the sheaths), *all approximate or aggregated: sheaths very short, each usually bearing an awn-like bract of its own length: perigynium ovate, strigose-hairy, with a short erose beak, longer than the obtuse hyaline-margined scale.* — Cottonwood Lake, Wahsatch

Mountains, 9,000 feet altitude; and high northward. A delicate and pretty species. The terminal spike is rarely all pistillate.

* * *Sheathless: bracts green or foliaceous: perigynium triquetrous.* — TRIQUETRÆ.

13. **C. pubescens,** Muhl. *Whole plant soft hairy:* culms slender, 1 to 2 feet high: leaves flat and soft: pistillate spikes 2 to 4, *oblong and rather tightly flowered,* ¼ to ¾ inch long, scattered near the top of the culm, the lowest shortly peduncled and *subtended by a leafy sheathless bract from* 1 *to* 3 *inches long;* perigynium ovate, *boldly triquetrous, very hairy, contracted into a slender nearly entire beak over half as long as the body: scale broad below, white and thin on the margins, abruptly contracted into a rough awn which equals or exceeds the perigynium.* — Missouri River below Fort Pierre (*Hayden*). A species of doubtful affinity, placed here provisionally.

§ 5. *Spike one* (in our species), *small, the pistillate flowers few: perigynium smooth* (*sometimes minutely dentate on the angles*), *firm or horny, mostly shining or glossy, lightly nerved or nerveless, bearing a short beak: scales obtuse with hyaline margins: stigmas* 3. (The mature perigynium of No. 15 is unknown.) — LAMPROCHLÆNÆ, Drejer. Small plants, with creeping rootstocks. Our species all fall under the group *Rupestres,* Tuckm.

14. **C. rupestris,** All. *Cespitose and somewhat stoloniferous:* culms obtusely angled, erect, 1 to 4 inches high, usually a little longer than the long-pointed and *mostly channelled leaves; spike linear or clavate* (½ to 1 inch long): *perigynium upright, plano-convex, obovate or elliptic, firm in texture, dull, very lightly nerved, abruptly contracted into a short and stout truncate beak, hidden by the amplectant and very broad dark scale.* — *C. Drummondiana,* Dew. Sierra Blanca, Col. (*Hooker & Gray*), and *Hall & Harbour* No. 273, according to Wm. Boott; British America and high northward. (Eu.)

15. **C. Lyoni,** Boott. Rootstocks somewhat creeping or perhaps strictly cespitose: culms short, 1 to 6 (usually 2 or 3) inches high, *rigid,* mostly shorter than the *very rigid, bristle-like glaucous leaves,* surrounded at the base by a mass of brown leafless sheaths: spike linear; the staminate flowers 3 to 6; the pistillate 7 to 9: perigynium ovate-lanceolate, pallid, finely few-nerved; the beak hyaline, minutely and obliquely toothed, about the length or a little shorter than the obtuse and hyaline-margined scale. — Twin Lakes (*John Wolfe*) and Berthoud Pass (*Vasey*), Colorado; also in British America. Known only from immature specimens. Its stiff and bristle-like leaves and culms are its best known characters.

16. **C. obtusata,** Lilj. *Very extensively creeping by long and slender brownish rootstocks:* culms 2 to 7 inches high, longer than the *flat and long-pointed leaves: spike at maturity ovate or narrowly ovoid,* half-inch or less long, the pistillate flowers 4 to 10: perigynium at first pale, brownish at the top, *when mature spreading and becoming brown or dark brown-purple, glossy, very horny in texture, turgid-ovate, stipitate, contracted into a stout obliquely cut and conspicuously white-hyaline beak, longer and broader than the membranaceous, acute, and often deciduous scale:* achenium short and broadly triangular. — *C. spicata,* Schk *C. affinis,* R. Br. *C. obesa,* All., var. *monostachya,* Bœckeler. South Park, Colorado, to Montana, westward and northward. (Eu.)

§ 6. *Spikes* 2 *or more* (1 in No. 17), *more or less peduncled: staminate spike one in our species: pistillate spikes mostly compactly flowered and cylindrical, erect: bracts leafy, sheathing or sheathless: perigynium firm in texture, smooth* (except in No. 24, and in young specimens of No. 23), *slightly inflated, very shortly and stoutly beaked or sometimes beakless, conspicuously nerved* (except in No. 22). — BRACHYRHYNCHÆ. Slender, not very leafy species.

* *Spike one, staminate above: perigynium beakless.* — POLYTRICHOIDEÆ, Tuckm. Including one very slender species of doubtful affinity, intermediate between the *Pallescentes* and the *Elongatæ*.

17. **C. polytrichoides,** Muhl. Cespitose: culms many, almost capillary, usually longer than the very narrow leaves: staminate flowers very few: perigynia 2 to 8, alternate and appressed, green, triangular below, flattened towards the top, blunt or emarginate at the apex, much longer than the ovate acute scale: stigmas rarely 2. — Low ground, Colorado and northward.

* * *Staminate spike in our species sessile or short-stalked: pistillate spikes short* (*occasionally an inch long in No.* 19): *perigynium obtuse or short beaked, straight at the apex, longer than the white or tawny acute scale.* — PALLESCENTES, Fries.

18. **C. Torreyi,** Tuckm. Culms 8 to 16 inches high, *sharply angled,* longer than the *hairy leaves: pistillate spikes* 1 *to* 3, *roundish, approximate, almost sessile: perigynium round-obovate, sunken at the top, very abruptly tipped with a short stout hyaline-margined beak: bracts short,* about the length of the culm, *sheathless.* — Clear Creek Cañon, near Golden City, Colorado (*Rev. E. L. Greene*); also in British America; rare.

19. **C. grisea,** Wahl. *Culms lax,* 8 to 20 inches high: leaves *smooth, lax, and flat* (3 lines wide in typical forms, often much narrower): pistillate spikes 3 to 6, *rather loosely flowered and cylindrical, or sometimes reduced to* 2 *or* 3 *flowers, remote, all more or less peduncled: bracts wide and leaf-like, surpassing the culm: perigynium large, turgid-oblong, green, finely many-nerved, finely punctate with shining glands, beakless or very nearly so: scale rough-awned.* — S. Utah (*Dr. E. Palmer*) and southeastward; Nebraska (*Hayden*). This species bears little general resemblance to the preceding.

* * * *Staminate spike usually long-peduncled: pistillate spikes scattered, all* (*at least the lower*) *on exserted stalks: bracts shorter than the culm* (*longer in No.* 20), *sheathing: perigynium glaucous-green before maturity, becoming pale or yellow, the apex oblique or bent and short-beaked* (*or nearly beakless in No.* 20). — PANICEÆ, Tuckm.

20. **C. aurea,** Nutt. *Stoloniferous:* culm 1 to 12 inches high, *slender,* sharply angled, longer or shorter than *the flat and narrow glaucous leaves: bracts leaf-like, the lower much exceeding the culm:* spikes 3 to 6, the staminate often nearly sessile, *the pistillate loosely flowered, the lower remote, often on radical peduncles:* scales colored on the margins, ovate, shorter than the *turgid, globose or pear-shaped, bright yellow or straw-colored and wholly obtuse or slightly pointed perigynium:* stigmas commonly 2. — Common throughout on moist grassy hillsides and low mountains. A delicate and pretty species, readily distinguished when mature by its bright colored, often almost fleshy perigynia. The staminate spike is occasionally pistillate at the apex. The apex of the perigynium is often slightly excurved as in the true *Paniceæ*.

21. **C. tetanica,** Schk. *Creeping:* culms *strict, slender,* 6 to 20 inches high, sharply angled, *longer than the pale or bluish leaves: staminate spike long-peduncled:* pistillate spikes 1 to 4, *usually all peduncled, slender, cylindrical, varying from compactly to loosely flowered, attenuated at the base: perigynium tapering at each end, more or less 3-angled, scarcely inflated, with a very short bent point, longer than the nearly obtuse or shortly cuspidate scale.* — Indian Territory and northward; also in British America. Distinguished from its eastern allies, *C. panicea* and *C. Meadii* (the latter of which may occur within our limits), by its more slender spikes, which are loosely flowered at the base, and its less inflated perigynium.

* * * * *Terminal spike stalked, pistillate at the top: pistillate spikes oblong or cylindrical, densely flowered, erect: bracts sheathless or nearly so, leaf-like: perigynium ovate or obovate, straight, nearly or quite beakless.* — VIRESCENTES, Kunth.

22. **C. Shortiana,** Dew. Culms leafy, 1 to 2½ feet high: leaves long, flat, *rather wide, smooth or very nearly so:* pistillate spikes 3 to 6, *evenly cylindrical,* ¾ *to* 2 *inches long, the lower long peduncled, all sparingly staminate at the base: perigynium broadly and shortly obovate, nerveless, minutely pointed, squarrose, somewhat longer than the rather obtuse scale.* — Indian Territory (*Geo. D. Butler*); Nebraska (*Hayden*).

23. **C. triceps,** Michx. *Cespitose:* culms slender, 8 to 18 inches high, shorter or longer than the *soft, narrow, flat and hairy* (rarely nearly smooth eastward) *leaves: spikes* 1 *to* 3, *approximate and nearly sessile, globular, ovoid, or short cylindrical, thick* (½ inch or less long): *perigynium sparsely hairy when young, smooth when mature, ovate or broadly obovoid, turgid and conspicuously many-nerved when ripe, pointless and nearly entire or tipped with a very short and slightly* 2*-toothed beak, about the length of the acute or awn-pointed scale.* — *C. hirsuta,* Willd. *C. Smithii,* T. C. Porter. Indian Territory (*Geo. D. Butler*) and southward.

24. **C. virescens,** Muhl. *Cespitose: culms many, very slender,* 8 inches to 3 feet high, often much attenuated, about the length of the *narrow and flat long-pointed, hairy leaves: spikes green, oblong or narrowly cylindrical,* ½ to 2 inches long, rarely nearly globose in attenuated specimens, *short-stalked and ascending: perigynium ovate or oval, thickly hairy at maturity, strongly few-nerved, beakless, mostly longer than the acute whitish scale.* — Indian Territory (*Geo. D. Butler*).

§ 7. *Staminate spike mostly solitary and peduncled* (sometimes sessile in No. 26), *the upper part usually pistillate in the Gracillimæ: pistillate spikes several or many, more or less loosely flowered, all or the lower on filiform weak or nodding peduncles: bracts foliaceous and sheathing: perigynium thin and membranaceous, usually slender or oblong, tapering gradually into a distinct or long minutely toothed straight beak, smooth and shining* (in No. 23 usually hairy on the angles and not lucid), *mostly light-colored, somewhat inflated. Scales thin, white, tawny, or brown.* — HYMENOCHLÆNÆ, Drejer. Mostly slender and open-flowered lax-growing species.

* *Terminal spike usually pistillate above: pistillate spikes narrow, long-cylindrical, rather compactly flowered, the lower on long-exserted or nodding peduncles:*

perigynium ovate-oblong, many-nerved, turgid, green at maturity. — GRACILLIMÆ, Carey.

25. **C. Davisii,** Schw. and Torr. Culm leafy, lax, 1 to 2 feet high: leaves wide and flat, pale, more or less hairy: pistillate spikes about three, usually an inch or more long and two or three lines broad: perigynium large and turgid, prominently 12 to 15-nerved, gradually narrowed into a short and stout slightly 2-toothed beak, about the length of the pale awned scale. — *C. Torreyana,* Dew. Moist grassy places, Indian Territory (*Geo. D. Butler*) and northward.

* * *Terminal spike all staminate: pistillate spikes in our species very narrow and slender and long-exserted and nodding, loosely flowered: perigynium small, not inflated.* — DEBILES, Carey.

26. **C. arctata,** Boott. Slender, 1 to 2 feet high: culm leaves short (2 to 4 inches) and broad; radical leaves mostly short and spreading, all smooth: pistillate spikes long-linear, 1 to 3 inches long and a line wide, all nodding at maturity, very loosely flowered towards the base: perigynium small, somewhat 3-angled, prominently about 2 or 3-nerved, pointed, rather longer than the acute, white scale. — Along the Missouri at Fort Pierre (*Dewey*).

* * * *Terminal spike all staminate: pistillate spikes oblong, club-shaped or cylindrical (very small in No.* 27), *less drooping: perigynium few-nerved or nerveless, tawny or whitish.* — FLEXILES, Tuckm.

27. **C. capillaris,** L. *Usually densely cespitose: culms very slender,* varying from an inch to 15 inches (var. *elongata,* Olney) in height, *much longer than the numerous very narrow radical leaves:* pistillate spikes 1 to 4, *loosely* 3 *to* 10-*flowered, long-exserted and nodding, the lower often very remote: perigynium small, ovate or ovate-oblong, contracted into a nearly entire beak of about half its length, about the length or longer than the white or tawny hyaline scale.* — High mountains from Colorado westward and northward. A delicate species, variable in size and in the length and shape of the pistillate scales. (Eu.)

28. **C. frigida,** All. *Stoloniferous: culm slender,* 1 to 1½ feet high, *much longer than the short and rather broad many-nerved, lax radical leaves: bracts conspicuously and loosely sheathing,* the lower more or less leaf-like, the upper setaceous: *pistillate spikes ferruginous, nearly or quite an inch long, the lower club-shaped and long-exserted, the upper more or less cylindrical and often sessile or nearly so and approximate: perigynium lanceolate,* slightly inflated, *flattened,* at first wholly or partly green, at length *becoming more or less ferruginous, obscurely nerved, hairy on the angles,* tapering and 2-toothed, *longer than the acute dark-brown scale.* — Cottonwood Lake, Utah (*Sereno Watson*); also in Oregon. (Eu.) — (See Addendum.)

29. **C. longirostris,** Torr., var. **minor,** Boott. *Cespitose:* culm rather strong, 6 to 8 inches high, obtusely angled, rather longer than the *flat and soft leaves:* pistillate spikes 2 to 3, *greenish-white, short* (½ inch long), *thick, nearly erect: perigynium large, 2-nerved, green and shining, produced into a slender white-tipped toothed beak of half or more its length:* scale white, acute or cuspidate, about the length of the perigynium. — Colorado (*Hall & Harbour*). — The species, differing in its much greater size, longer and at length long-pendulous spikes, and very long-beaked perigynium, occurs near the boundary in British America.

§ 8. *Staminate spikes one or more: pistillate spikes two to several, stout, erect, mostly shortly peduncled, somewhat squarrose or comose in appearance: perigynium thick in texture, hairy, more or less spreading, distinctly and stoutly straight-beaked, the teeth short: scales prominent.* — LASIOCARPÆ, Fries. Stout, mostly tall species, in wet or grassy places. Our species falls under the group *Lanuginosæ*, Carey.

30. **C. filiformis,** L., var. **latifolia,** Beklr. Stoloniferous: culms 1 to 2½ feet high, strong: leaves flat 1 to 2 lines broad, about the length or longer than the culm: staminate spikes 1 to 3, the lower small and aggregated at the base of the terminal one: pistillate spikes 1 to 4, remote, sessile or nearly so, or the lower peduncled, ¾ to 2 inches long, often loosely flowered at the base: bracts leaf-like, usually much exceeding the culm, the upper sheathless: perigynium ovate or shortly ovoid, abruptly contracted into a very short, erect, divergently and very shortly toothed beak: scales ovate, purple, acute or cuspidate, shorter or longer than the turgid and densely hairy perigynium. — *C. lanuginosa,* Michx. *C. pellita,* Muhl. Throughout, in wet and swampy places.

Var. **æmatorhyncha,** W. Boott, is a form with purple beaks: scarcely distinct from the last variety. — *C. æmatorhyncha,* Desv. Jordan Valley, Utah (*Sereno Watson*).

The species may be expected in Montana. It is distinguished by its filiform and involute leaves.

§ 9. *Staminate spike mostly single: pistillate spikes 2 to 4, short, oblong or globular, sessile or nearly so, erect, compactly flowered, in our species approximate at the top of the culm and subtended by long and leafy bracts: perigynium smooth, nerved, conspicuously beaked, not prominently toothed.* — SPIROSTACHYÆ, Drejer. Rather slender species.

31. **C. flava,** L. Culm slender, 4 to 18 inches high, smooth, longer than the narrow stem leaves: bracts much longer than the culm, leaf-like, very shortly sheathed: staminate spike short, mostly sessile: perigynium shining, yellowish, reflexed at maturity, twice the length of the scale. — Meadows and wet places, Hudson's Bay Creek, Montana (*W. M. Canby*), and northward. (Eu.)

§ 10. *Staminate spikes two or more, long-stalked: pistillate spikes 2 to several, usually all peduncled, long and heavy, loosely flowered, erect or nodding: perigynium large, thick in texture, strongly nerved, hairy or smooth, produced into a long beak which terminates in very conspicuous awl-like erect or spreading teeth.* — ECHINOSTACHYÆ, Drejer. Coarse species.

32. **C. trichocarpa,** Muhl., var. **aristata,** Bailey. Culms very stout, sharply angled: sheaths and under side of the leaves sparsely hairy: staminate spikes 3 to 8, usually considerably separated; the scales very long, loose and pointed: pistillate spikes 2 to 3 inches long, 5 lines or more broad, upright, scattered, loosely flowered at the base: perigynium very strongly nerved, smooth, ovate-lanceolate, terminated by very conspicuous divaricate, smooth and slender teeth (which are 1½ to 2 lines long), usually longer than the rough-awned scale. — *C. aristata,* R. Br. *C. mirata,* Dew. Bogs and creeks, Utah (*Watson, L. F. Ward*); to British America.

Var. **Deweyi,** Bailey. Usually more slender than the last, the leaves and sheaths smooth: pistillate spikes 1 to 2 inches long and ½ inch or less broad: perigynium very smooth, usually somewhat polished, rather coriaceous, the nerves not conspicuous, the teeth mostly short: scale usually not conspicuously awned. — *C. læviconica*, Dew. Big Sioux and Yellowstone Rivers (*Hayden*), Bismarck, Dakota (*A. B. Seymour*). These varieties pass by all gradations into the species, which may occur within our eastern limits.

§ 11. *Sterile and fertile spikes one to several or many: fertile spikes mostly large and compactly flowered: perigynium much inflated (cross-section nearly twice or much more than twice the width of the mature achenium), membranaceous, smooth, conspicuously nerved* (or nearly nerveless in No. 35), *tapering into a toothed beak as long as the body or longer.* — PHYSOCARPÆ, Drejer. Mostly large and stout species, to be regarded as the most developed of the genus. No. 35 is the least developed of the section, and in some forms it appears to ally itself with other and very dissimilar sections.

* *Staminate spike solitary, stalked: pistillate spikes sessile or nearly so, short and thick, at maturity green or greenish-tawny, usually turning dark-colored in drying: perigynium large, very turgid at the base, gradually lengthened into a long-conical slenderly toothed beak which much exceeds the scale.* — LUPULINÆ, Tuckm.

33. **C. lupulina,** Muhl. Tall and leafy (2 to 3 feet high): fertile spikes 2 to 4, several to many-flowered, heavy, turgid-oblong or cylindrical, approximate or the lower remote and on more or less exserted stalks, becoming nearly straw-colored at full maturity: bracts wide, long and leaf-like, the lower sheathing: perigynium upright. — Indian Territory and southward in wet places.

C. INTUMESCENS, Rudge, distinguished by its few-flowered and aggregated sessile, greener spikes, sheathless bracts, and more spreading perigynia, has a similar range as the last, but has not yet been found within our limits. It also occurs in British America.

* * *Staminate spikes commonly more than one: pistillate spikes usually long and densely cylindrical (short in No. 35 and occasionally in No. 38): perigynium smooth and shining, long-beaked, at maturity yellow or straw-colored, or occasionally partly reddish purple.* — VESICARIÆ, Tuckm.

← *Staminate spike one: pistillate spikes comose, cylindrical and drooping or spreading: bracts sheathless or nearly so: beaks long.*

34. **C. hystricina,** Muhl. Plant rather slender, pale, 12 to 18 inches high: spikes 2 to 4, narrow (¾ to 2 inches long and ½ inch and less wide), nodding or the upper one nearly erect or spreading, decidedly comose in appearance: perigynium 15-nerved, not prominently inflated, prolonged into a very slender and setaceously toothed beak, the lobes of which are spreading: scales awn-like, shorter than the perigynium. — *C. Cooleyi* and *C. Thurberi*, Dew. Wet places, New Mexico and northeastward to Nebraska. Distinguished from *C. tentaculata*, Muhl., which may occur within our southeastern border, by its smaller, more comose and more nodding spikes, and by its smaller

or more nerved (10-nerved in that species) perigynia. *C. hystricina* affords a transition to the *Echinostachyæ*.

C. SQUARROSA, L., occurs at Fayetteville, N. W. Arkansas (*F. L. Harvey*). It is at once distinguished by its exceedingly densely flowered short, upright spikes, the terminal one being androgynous. It is one of the *Squarrosæ*, Carey.

+– +– *Staminate spike one, rarely two: pistillate spikes short, erect, more or less purplish: beaks short: stigmas usually two.*

35. **C. saxatilis,** L. Stoloniferous: culm 4 to 12 inches high, sharply angled, about the length of, or a little longer than, the narrow and sharp-pointed leaves: pistillate spikes one to three, the upper sessile or nearly so, the lower mostly more or less peduncled, all dark purple or at maturity becoming brown: bracts narrow, long-pointed, shorter or a very little longer than the culm: perigynium ovate-oblong or elliptic, nerveless or very inconspicuously nerved at the apex, rather abruptly contracted into a very short nearly entire beak, mostly longer than the more or less obtuse membranaceous scale. — *C. pulla,* Gooden. *C. vesicaria,* var. *alpigena,* Fries. Rocky mountains of British America and northward, and no doubt on our higher mountains. (Eu.)

Var. **Grahami,** Hook. & Arn. Stouter, 12 to 20 inches high: perigynium lighter colored, often nearly straw-colored, prominently few-nerved, the beak longer and more conspicuously toothed. — *C. Grahami,* Boott. *C. vesicaria,* var. *dichroa,* Anderss. *C. saxatilis,* var. *major,* Olney. High mountains of Colorado, Utah, and northward. (Eu.)

+– +– +– *Staminate spikes two or more: pistillate spikes normally long, spreading or drooping: stigmas three.*

+– +– *Perigynium conspicuously turgid, ascending at maturity.*

36. **C. vesicaria,** L. Stoloniferous: *culms stout,* 1 to 2½ feet high, scabrous, *shorter than the upper leaves:* leaves flat, 2 to 3 lines broad: pistillate spikes 2 to 4, *thick* (4 to 8 lines in diameter), *the upper sessile, the lower on weak or nodding peduncles: perigynium ovate-lanceolate, one third or less as broad as long, gradually tapering into a slender beak,* 12 *or more nerved, longer than the inconspicuous scale.* — Uinta Mountains, Utah? (No. 1270 King's Survey, an immature specimen), California, and Oregon. (Eu.)

37. **C. monile,** Tuckm. *Culms usually more slender and leaves a little narrower: spikes more slender: perigynium subglobose, much inflated towards the base, one half or more as broad as long, abruptly short-beaked,* 10 *or less nerved:* otherwise as in the last. — *C. Vaseyi,* Dew. Colorado (*Vasey*).

+– +– *Perigynium not conspicuously turgid, squarrose at maturity, and the spikes comose in appearance.*

38. **C. utriculata,** Boott. Somewhat stoloniferous: *culm very stout* (1 to 3 feet high), *acutely angled above, very thick and spongy at the base: leaves broad* (2 to 6 lines), carinate at the base, much exceeding the culm, *conspicuously nodulose-reticulated:* pistillate spikes 2 to 6, *more or less remote,* the upper sessile, the lower often on weak peduncles an inch or two long, long-cylindrical or terete (1 to 7 inches long), thick and compactly flowered (sometimes

loosely flowered at the base), *often staminate at the top: perigynium ellipsoid or globose-ovoid, usually gradually tapering into a short beak,* broader and commonly longer than the *very acute or rough-awned scale.* — Var. MINOR, Sartwell, is a form smaller in all its parts, with spikes an inch or so long. — Common in swamps from Colorado and Utah northward. Too near the next.

39. **C. ampullacea,** Good. *Culm rather slender, obtusely angled, not conspicuously thickened at the base: leaves narrow* (⅛ to 2 lines broad), *canaliculate, finely and inconspicuously nodulose below, gradually tapering into very long points: spikes fewer, narrower and shorter, more approximate, the lower seldom much exserted: perigynium subglobose or globose-elliptic, in typical forms shortly and abruptly beaked,* longer than the normally *muticous scale.* — In similar situations with the last, but evidently less common, from Colorado and Utah northward. (Eu.)

§ 12. *Staminate spikes one or more, long: pistillate spikes one to several, brown, purple, or greenish, commonly approximate, sessile or peduncled, oblong or linear, mostly elongated: perigynium not inflated, biconvex, minutely beaked or beakless, smooth: stigmas* 2. — MICRORHYNCHÆ, Drejer. Paludose and alpine species of upright habit, often growing in tufts or tussocks. Our species fall under the group *Acutæ,* Fries.

* *Perigynium strongly nerved.*

40. **C. Jamesii,** Torr. Stoloniferous: culm 1 to 2 feet high, rough on the sharp angles, longer than the glaucous, long-pointed leaves: staminate spikes 1 to 4, usually one, large, occasionally bearing a few pistillate flowers at the top: pistillate spikes 2 to 4, erect, the upper sessile or nearly so, the lower more or less peduncled, broadly cylindrical, often inclining to club-shaped; lower bract often leaf-like: perigynium oval or obovate, ascending, abruptly contracted into a short, toothed (rarely nearly entire) beak, greenish, about the length of, or a little longer than, the obtuse or abruptly cuspidate scale, and twice as broad. — Colorado, Utah, and southward. Spikes sometimes purplish.

Var. **Nebraskensis,** Bailey. Culm stouter, smooth or nearly so, about the length of the leaves: pistillate spikes mostly short, narrowly cylindrical or terete: perigynium squarrose or spreading, usually rusty brown, a little shorter than the gradually pointed, narrower scale. — *C. Nebraskensis,* Dew. With the species and eastward.

* * *Perigynium slightly nerved or nerveless.*

+ *Robust species (mostly): bracts leaf-like, usually exceeding the culm.*

41. **C. laciniata,** Boott. *Culm very sharply angled,* 2 to 3 feet high, *rough on the angles,* at least above: leaves very long: pistillate spikes 3 to 6, dark brown, 1 to 3 inches long, cylindrical and closely flowered, remote, the upper sessile, the lower nodding or spreading on exserted peduncles and loosely flowered at the base: *perigynium oval or elliptic, sometimes nearly circular, contracted into a short, toothed beak, usually toothed on the angles above* (the teeth deciduous with age), *faintly several nerved, about the length of the narrow pale-*

ribbed, ciliate (laciniate) *scale.* — Provost River, N. Utah (*Sereno Watson;* an ambiguous specimen). The leaves usually dry, stiff and hard. The lowest bract is often very much prolonged.

42. **C. aquatilis,** Wahl. *Stoloniferous: culm obtusely angled,* 2 to 3 feet high, *smooth, leafy: leaves flat, pale, scarcely longer than the culm:* pistillate spikes 2 to 4, *erect, thick and compactly flowered throughout or more commonly inclining to club-shaped with a gradually attenuated base,* the upper sessile, the lower more or less peduncled and often long-exserted: *perigynium broadly elliptic or obovate, rarely circular, nerveless, tipped with a minute and entire point, green or light-colored, wider and either longer or shorter than the green or purple-margined acutish scale.* — Wyoming (*W. Boott*); probably generally distributed. A large species in wet places, readily distinguished from the next by its stout and leafy smooth culms, wide and amplectant bracts, and thick spikes. (Eu.)

Var. **sphagnophila,** Anders. *Slender,* 8 to 16 inches high: *leaves very narrow, long-pointed: spikes slender, very loosely flowered and long-attenuated below, the lower peduncles slender and flexuose: perigynium about the width of or a little wider than the dark purple scale.* — *C. aquatilis,* var. *minor,* Boott. *C. borealis,* Lange. *C. personata,* Olney. Twin Lakes, Colorado (*John Wolfe*); also in British America. (Eu.)

C. LENTICULARIS, Michx., may be expected northward. It may be distinguished from *C. aquatilis* by its smaller size, narrower spikes the terminal one of which is pistillate at the top, and the nerved perigynium.

+– +– *Low or tall and slender species: bracts mostly short and narrow, often setaceous* (*rarely long in Nos.* 42 *and* 43).

++ *Culms slender and tall* (2 *feet or more high*): *leaves with more or less revolute margins when dry.*

43. **C. stricta,** Lam. *Densely cespitose, forming high tussocks in wet places:* culms 2 to 5 feet high, *sharply angled, rough, leafy only at the base, longer than the narrow and long-pointed carinate leaves,* when full grown surrounded below by the *conspicuous reticulated fibrous remains of the older sheaths:* pistillate spikes 2 to 4, *erect or spreading,* sessile or the lower shortly peduncled and sometimes loosely flowered at the base, *linear, often male at the top;* lower spike or two often subtended by a narrow bract barely as long as the culm: *perigynium oval or ovate, green or light-colored, nerveless or nearly so, the point entire or slightly emarginate, little broader and longer or shorter than the purple-margined ascending acute or acutish scale.* — *C. Virginiana,* Smith. *C. acuta,* Muhl., etc. *C. angustata,* Boott. *C. xerocarpa,* S. H. Wright. Colorado (*Brandegee, Vasey*).

44. **C. aperta,** Boott, var. **divaricata,** Bailey. Differs from the last in its *smoother culm, in the absence of reticulated fibrous sheaths, and in the broader perigynium which is subtended by an acute spreading scale of more than its own length:* bracts sometimes leaf-like. — Colorado (*Vasey*). Differs from the typical Eastern *C. aperta,* which may be expected in our region, in its greater size, wider leaves, and looser habit, larger perigynia, and more conspicuously divaricate, darker scales.

↔ ↔ *Culms* 3 *to* 18 *inches high: leaves more or less involute when dry.*

45. **C. vulgaris,** Fries. Stoloniferous, not tufted, bluish in appearance: culms mostly stout, sharply angled, smooth except near the top, longer than the narrow leaves: staminate spikes 1 to 3, usually 2: pistillate spikes 2 to 4, usually about an inch long, stout, densely flowered (or the lower rarely loosely flowered at the base), erect, sessile or the lower shortly peduncled, green and black in appearance, with a bract nearly or quite as long as the culm: bracts usually bearing minute purple auricles at the top of the sheath: perigynium appressed, oval, ovate or round-ovate, finely striate towards the base, bright green above the middle, the distinct beak entire or emarginate, longer and broader than the obtuse, black, green-nerved appressed scale. — Twin Lakes, Colorado (*John Wolfe:* these specimens were named *C. turfosa*, Fries, in the Preliminary Report of Wheeler's Survey, but they lack the yellowish-purple spikes and rough-angled perigynia of that Scandinavian plant).

A perplexingly variable species, distinguished from Nos. 43 and 44 by its lower, stiffer, less cespitose habit, and thicker, oblong, conspicuously green and black spikes, and more nerved perigynia, rather than by any positive descriptive characters. Scandinavian caricographers state that reticulated basal sheaths never occur in any of the forms of this species. The auricles at the base of the bracts are often inconspicuous, and they are sometimes present in *C. stricta* and others of the *Acutæ*. The type of the species is common in the Eastern United States, in Europe, and in Asia. In our region the following varieties appear to be clearly made out: —

Var. **juncella,** Fries. Cespitose and very slender: leaves narrow, longer than the culm: spikes linear, often much attenuated at the base: perigynium elliptic or broader, distinctly nerved and beaked, longer than the obtuse black-margined scale. — *C. Kelloggii*, W. Boott. Wahsatch Mountains, Utah (*Watson, M. E. Jones*). Different from all other forms of *C. vulgaris* in its slender and lax habit. It much resembles the type in the green and black of its spikes. (Eu.)

Var. **hyperborea,** Boott. Culms and leaves as in the species: staminate spike one: pistillate spikes 3 to 5, slender, lax, loosely flowered at the base, the lower peduncled and often remote, black-purple or fuscous-purple: perigynium narrow, mostly elliptic, almost pointless, entire at the orifice, very faintly nerved towards the base, shorter or rarely a little longer than the acute or acutish dark purple scale. — *C. hyperborea*, Drejer. *C. limula*, Fries. *C. Bigelovii*, Torr. *C. Washingtoniana*, Dew. *C. rigida*, var. *Bigelovii*, Tuckm. Alpine regions, Colorado, northward and westward. (Eu.)

Var. **alpina,** Boott. Leaves broad (2 lines) and flat: staminate spikes sometimes 2, usually 1: pistillate spikes 3 to 5, short and thick (3 to 9 lines long), erect, approximate or the lowest sometimes remote and shortly peduncled, dark purple: auricles very prominent: perigynium obovate or nearly circular, nerveless, shortly beaked, pale below, usually more or less purple above, commonly shorter than the very dark, acute scale. — *C. rigida*, Gooden. *C. saxatilis* of Scand. authors, not L. With the last. (Eu.)

§ 13. *Staminate spike one, short, either pistillate above or not conspicuous* (except in No. 46): *pistillate spikes none to several, short and thick, mostly dark-colored, commonly aggregated* (*often only approximate*) *sometimes staminate at*

the base: perigynium biconvex or very obtusely 3-angled, with a very short entire or emarginate beak, or beakless: stigmas 2 or 3. — MELANOSTACHYÆ, Tuckm. Mostly mountain or boreal species, distinguished by the aggregated spikes and inconspicuous or androgynous terminal spike and nigrescent color. To be regarded as probably the least evolved section of the genus, connecting the two subgenera.

* *Terminal spike all staminate (in No. 46 often with a few pistillate flowers at base or apex, or rarely all pistillate and diœcious), cylindrical: pistillate spikes approximate, erect: stigmas usually 3.* — STYLOSÆ.

46. **C. Parryana,** Dew. Stoloniferous: *culms rigid,* 2 to 16 inches high, *stout, obtusely angled, smooth or nearly so, granulated, longer than the rigid, long-pointed, narrow leaves: terminal spike usually largest, about an inch long, brown, with* 1 *to* 5 *small, globular, oblong, or cylindrical erect spikes near its base* (or sometimes entirely solitary!), the lower usually subtended by a narrow bract shorter than the culm and often more or less remote and shortly peduncled: *perigynium obovate or triangular-obovoid, somewhat plano-convex, scabrous above, lightly nerved especially on the outer side, very abruptly short-beaked, the orifice entire or erose-hyaline, shorter and about the width of the very obtuse, brown, white-nerved, hyaline-margined, sometimes minutely apiculate and ciliate scale.* — *C. arctica,* Dew. *C. Hallii,* Olney. South Park, Colorado, and northward in the mountains: rare. Named for Capt. Parry, the Arctic explorer. The monostachyous specimens resemble No. 5, from which they are readily distinguished by the hairless perigynia.

47. **C. Raynoldsii,** Dew. Stoloniferous: culms 13 inches to 3½ feet high, *sharply angled,* longer than the *flat, glaucous leaves: staminate spike sessile, about half an inch long:* pistillate spikes 3 to 6, *short and thick* (4 lines wide), *not commonly more than twice as long as broad* (and usually less), *sessile or short peduncled, aggregated,* or the lowest an inch or two remote and exserted: lower bract about the length of the culm, *bearing conspicuous purple auricles: perigynium large, obovoid, 3-angled, prominently nerved, green or light-colored, abruptly narrowed into a nearly entire purple beak, somewhat spreading, when mature much longer and broader than the acute black scale.* — *C. Lyallii,* Boott. Mountains, Utah to Wyoming.

* * *Terminal spike staminate: pistillate spikes ovoid or oblong and drooping: stigmas 3.* — LIMOSÆ, Tuckm.

48. **C. Magellanica,** Lam. Loosely tufted: culms 1 to 2 feet high, smooth, about the length of or shorter than the leaves: pistillate spikes 2 to 4, rather loosely flowered, on peduncles of about their own length, sometimes with a few staminate flowers at their base or apex, the lowest with a bract which exceeds the culm: perigynium nearly orbicular, granular, whitish, entire at the orifice, few-nerved, about half as long as the long-pointed brown-purple scale. — *C. irrigua,* Smith. Uinta Mountains, Utah. (Eu.)

* * * *Terminal spike club-shaped, staminate below: lateral spikes occasionally bearing a few staminate flowers at base.* — ATRATÆ, Kunth.

+ *Scales, especially of the terminal spike, narrow and acuminate, very acute or awned, much longer than the perigynia.*

49. **C. Buxbaumii,** Wahl. Stoloniferous: culm 1 to 2 feet high, sharply angled, rough above, about the length of the firm, narrow leaves: pistillate

spikes 2 to 5, erect, sessile, or the lowest very shortly peduncled, distinct, usually more or less remote, glaucous-purple: perigynium elliptic, glaucous, nerved, rough-granular, contracted into a short emarginate or entire beak. — Bogs throughout, but evidently nowhere common. The terminal spike is rarely all staminate. The lower leaf sheaths are purple and at length fibrillose. (Eu.)

+– +– *Scales broad, not conspicuously acute.*

50. **C. atrata,** L. *Cespitose:* culm 6 inches to 2 feet high, sharply angled, *smooth or roughish,* longer than the *long-pointed leaves:* bracts about equalling the culm, *mostly with conspicuous auricles:* spikes 2 to 4, *densely flowered, clavate or oblong, thick,* ½ to 1½ inches long, *black or dark brown, approximate or often aggregated, all more or less peduncled, at first upright or spreading, at length usually drooping and often exserted, and the top of the culm appearing as if bent over: perigynium broadly ovate or orbicular, nerveless, bearing a short notched beak, commonly a little broader and about the length or a little shorter than the black or dark brown obtuse or acutish scale.* — Varies much: the spikes are sometimes more or less erect at maturity, the upper spike is rarely all staminate, and the upper scales are often acuminate but never awned. High mountains, Colorado and Utah and northward. (Eu.)

Var. **nigra,** Boott. *Spikes short, about as broad as long, densely aggregated and capitate, sessile, erect: midnerve of the scale generally projecting into a short cusp: perigynium usually scabrous.* — *C. nigra,* All. With the last. (Eu.)

Var. **ovata,** Boott. Resembling the drooping or open forms of the species, but the *spikes more slender, the whitish or green perigynium conspicuously broader and mostly longer than the brown scale,* giving to the graceful spikes a conspicuous *light and dark appearance.* — *C. ovata,* Rudge. Colorado, Utah, and southward.

Var. **erecta,** W. Boott. Like the last, but the *spikes erect, short, sessile or nearly so, and the staminate scales narrow.* — Nevada and westward; probably in our region.

51. **C. alpina,** Swartz. *Culms very slender,* 6 inches to 2 feet high, smooth, longer than the *narrow leaves:* spikes 2 to 4, *small* (½ inch and less long), *mostly compactly flowered, black or black and green, closely aggregated, erect and capitate, the lowest very short-stalked and usually subtended by a green bract: perigynium ovate or elliptic, obscurely nerved or nerveless, with a short slightly notched beak, green or fuscous, commonly a little longer than the ovate, black, nearly obtuse scale.* — *C. Vahlii,* Schk. High mountains, South Park, Colorado, and northward. A delicate species, distinguished from erect forms of the preceding species by its slender naked culm, and small, nearly globular spikes.

Subgenus II. **Vignea.** Staminate flowers few and inconspicuous, borne at the base or apex of the pistillate spikes. Pistillate flowers in short, sessile spikes (spike single in Nos. 52 and 53), which are commonly more or less aggregated into heads, or even panicled. Cross-section of the perigynium plano-convex in outline. Styles two and achenium lenticular. — The spikes, and especially the terminal one, usually have contracted bases when the staminate flowers are borne below, and empty scales at the top when the staminate flowers are borne above.

§ 14. *Staminate flowers borne at the top of the pistillate spikes; or in the Arenariæ spikes often wholly staminate and the plants occasionally diœcious.* — ACROARRHENÆ, Anderss.

* *Spike one and simple: plants very small.* — NARDINÆ, Tuckm.

52. **C. nardina,** Fries. *Densely cespitose: culms* ½ *to* 5 *inches high, rigid, about the length of the very numerous, setaceous, rigid or stiffly recurved leaves:* spike 1 to 4 lines long, *compactly flowered: perigynium oval or elliptic, obscurely nerved, abruptly very short beaked, erect, when mature usually about the length of the broad and obtuse brown scale.* — Upper Marais Pass (*W. M. Canby*), and high northward. Resembles the tristigmatous No. 14, with which it should perhaps be associated. (Eu.)

53. **C. gynocrates,** Wormsk. *Creeping: culms* 3 *to* 8 *inches high, longer than the rigid, erect or spreading leaves:* spike 2 to 6 lines long, *loosely flowered* (perigynium sometimes but one, *C. monosperma,* Macoun): *perigynium ovate, prominently nerved, gradually and conspicuously beaked, spreading at maturity, longer than the acute scale.* — South Park, Colorado (*John Wolfe*), and in British America. (Eu.)

* * *Spikes green when mature, aggregated or remote, never in compound heads.* (Here may be sought forms of No. 59.) — MUHLENBERGIANÆ, Tuckm.

+ *Spikes few-flowered, distinct, often remote.*

54. **C. tenella,** Schk. Tufted and stoloniferous: *culms very slender, almost capillary,* 6 to 16 inches high, about the length of the *narrow, loose leaves: spikes scattered,* 1 *to* 6*-flowered: perigynium shortly oval, rounded on the outside, finely nerved, abruptly and minutely beaked, longer than the very thin scale.* — *C. disperma,* Dew. *C. gracilis,* Carey. Swamps throughout.

55. **C. rosea,** Schk., var. **retroflexa,** Torr. *Tufted: culms slender, smooth,* longer than the *narrow leaves: spikes* 3 *to* 8*-flowered, mostly approximate, the lower distinct but not remote, stellate in appearance when mature: perigynium sessile, ovate-lanceolate, smooth throughout, finely nerved and spongy-thickened at the base on the inner side, gradually tapering into a toothed beak, at maturity widely spreading or reflexed, a little longer than the very acute scale.* — *C. retroflexa,* Muhl. Dry banks and copses, Indian Territory and southward. The species which probably occurs within our limits is distinguished by its more scattered spikes, shorter scales, and scabrous upper angles of the perigynium. From its allies, the species and its variety are distinguished by their small and stellate spikes.

+ + *Spikes several to many-flowered, aggregated into a globular or oblong head.*

56. **C. cephalophora,** Muhl. *Cespitose: culms rather stout, rough,* rather longer than the narrow leaves: spikes 3 to 6, *small, very densely aggregated, the head subtended by a setaceous, rarely leafy bract: perigynium broadly ovate, rather abruptly short-beaked, obscurely nerved on the outer side, rough above, mostly longer than the acute or cuspidate scale.* — Indian Territory and southwestward.

57. **C. Muhlenbergii,** Schk. *Culm stiff,* 1 to 2 feet high, *very sharply angled, rough,* usually a little longer than the *narrow and long-pointed leaves:*

spikes 6 *to* 10, *aggregated into an oblong more or less interrupted heavy head, each one subtended by a short setaceous bract: perigynium large, broadly ovate or orbicular-ovate, very conspicuously nerved, about the length of the rough-awned scale.* — Sterile soil "on the Missouri below Fort Pierre" (*Prof. Dewey*).

58. **C. cephaloidea,** Boott. Distinguished from the last by its *broad and long flat leaves* (about ¼ inch wide), *wing-margined entirely nerveless perigynium, and somewhat tawny heads.* — Fort Pierre, Dakota, and southward.

* * * *Spikes tawny or brown, somewhat chaffy in appearance, closely aggregated or densely capitate: perigynium ovate or ovate-lanceolate, not conspicuously nerved.* — FŒTIDÆ, Tuckm.

+– *Perigynium conspicuously rough on the angles above.*

59. **C. muricata,** L. One to two feet high, erect, the culm scabrous: spikes 3 to 12-flowered, approximate into a loosely interrupted head, the lower distinct, the pointed perigynia and scales conspicuous: perigynium green or greenish, stalked, ovate or ovate-lanceolate, nerveless or nearly so, gradually beaked, spreading, about the length of the acute brown scale. — Banks, Colorado, Utah, and southward. (Eu.)

Var. **confixa,** Bailey. Culms very slender, usually prolonged (1 to 2½ feet high): spikes 5 to 10-flowered, brown and green or tawny, aggregated into a rather loose continuous oval or oblong naked head (which is ½ to 1 inch long): perigynium usually narrower than in the species. — *C. Hoodii* of authors, not Boott. Wahsatch Mountains, Utah (*Watson,* 1228); N. W. Wyoming (*Parry* 281); also in British America, Oregon, and California. Distinguished from No. 58 by its smaller size, weak culm, narrow leaves, narrow perigynium, and rounder, smaller head. Much like *C. Hoodii,* Boott, which is distinguished by its stiffer culm, much heavier, more compact, and browner heads, which are made up of more numerous-flowered, more chaffy, and much longer more or less pointed spikes, and more upright perigynia which are mostly concealed beneath the scales. That species occurs in California and Oregon.

Var. **gracilis,** Boott. Slender: head more interrupted than in the species, almost linear, more fuscous, each spike subtended by a pointed or awned bract: perigynium erect, shorter than the very acute or cuspidate scale. — *C. Hookeriana,* Dew. With the species, and northward and eastward.

+– +– *Perigynium smooth or slightly scabrous.*

60. **C. fœtida,** All. *Creeping:* culm 5 to 16 inches high, *rather stout, scabrous, longer than the long-pointed leaves: spikes very densely aggregated into a globose or ovoid brown head: perigynium lanceolate or ovate-lanceolate, toothed at the apex, about the length of the acute or mucronate brown scale.* — Mountains, Colorado, Utah, and Wyoming. (Eu.)

61. **C. incurva,** Lightf.? *Extensively creeping: culm stiff and short* (½ to 6 inches long), *smooth, usually curved,* about the length of the *narrow and stiff curved leaves:* spikes 2 to 5, crowded into a short-ovoid or globular brown or tawny head (which is only ¼ to ⅜ inch long): *perigynium large and turgid, stipitate, broadly ovate, conical above, purple towards the top, faintly many nerved on one side at least, narrowed into a short and stout entire beak, not covered by the acute, thin scale.* — Rocky Mountains of British America. Immature speci-

mens from an alpine ridge near Middle Park (*C. C. Parry*) and from near Mt. Gray (*H. N. Patterson*), Colorado, are probably to be referred here. The specimens are peculiar for their upright habit, large and dark heads, and very broad, inflated perigynia.

62. **C. stenophylla,** Wahl. *Stoloniferous: culms stiff,* 1 *to* 6 *inches high from a mass of fibrillose sheaths,* usually longer than the *stiff involute filiform leaves:* spikes 3 to 6, *short* (2 to 4 lines long), *nearly globose, loosely conglomerated into a small subglobose or shortly oblong head,* each spike subtended by a scarious mucronate bract of less than its own length: *perigynium ovate, brown, nerved, gradually contracted into a short, blunt, entire beak, tightly enclosing the achenium, at maturity longer than the hyaline, brown, acutish scale.* — Dry hills and mountains, New Mexico, Colorado, eastward and northward; also in Iowa. (Eu.)

C. TERETIUSCULA, Gooden., distinguished by small chestnut-colored spikes disposed in an appressed or loose nearly simple panicle, will probably be found in Montana.

* * * * *Spikes yellow or tawny when mature (in No.* 63 *often green), aggregated into more or less compound heads or panicles: perigynium many-nerved, stipitate, tapering from a spongy base into a more or less conspicuous beak.* — VULPINÆ, Kunth.

+ *Beak shorter than the body of the perigynium.*

63. **C. conjuncta,** Boott. Culms flat, about the length of the broad and lax leaves: spikes 6 to many, loosely disposed into a long and interrupted head, the lower branches of which are sometimes compound: perigynium ovate, rough on the angles above, the base cordate on the outer side and conspicuously white-thickened, broader and a little longer than the acute scale. — *C. vulpina,* Carey, etc., not L. Fort Pierre, Dakota (*Dewey*): rare. Readily distinguished by its flat culm.

+ + *Beak twice or more the length of the body.*

64. **C. stipata,** Muhl. *Cespitose: culms thick and spongy,* 1 to 2 feet high, *very sharply* 3*-angled, almost winged,* about the length of the *broad light green canaliculate rough-edged leaves:* spikes 10 to 20, loosely aggregated into an *oblong or pyramidal head* (1 to 3 inches long), which is somewhat branching or occasionally nearly simple at the base: *perigynium lanceolate, finely nerved, the rough beak about twice the length of the rounded base,* the whole *about twice* (*or a little more*) *as long as the scale.* — Pastures and wet places throughout.

65. **C. crus-corvi,** Shuttl. Culms 2 to 4 feet high, *stout, sharply angled, leafy and glaucous: leaves* 4 *to* 9 *lines wide, glaucous: spikes very numerous, disposed in a large panicle which is* 4 *to* 9 *inches long with the lower branches conspicuous and usually long: perigynium peculiarly corky-thickened and truncate at the base, conspicuously few-nerved, the rough and slender beak thrice or more the length of the body, the whole three or four times the length of the inconspicuous scale.* — Indian Territory and southward. A conspicuous species with much the aspect of *Panicum crus-galli.*

* * * * * *Spikes yellow or tawny, aggregated into a long, appressed, compound or rarely simple head: perigynium small, ovate, few-nerved or nerveless,*

scarcely longer or shorter than the rough-pointed scale. — MULTIFLORÆ, Kunth.

66. **C. vulpinoidea,** Michx. Culms stiff, sharply angled, often scabrous, about the length of the narrow leaves: spikes 8 to 20, forming an interrupted brown or greenish-tawny head an inch or two long and composed of 6 to 10 crowded clusters, one or more of the lower spikes subtended by a short and setaceous or rarely somewhat leafy bract: perigynium diverging at maturity, more or less rough on the angles. — *C. multiflora,* Dew. *C. setacea,* Dew. Colorado (*Vasey*), Nebraska (*Hayden*). A widely variable species, running into a multitude of forms, of which only the following has decisive characters.

Var. **platycarpa,** Gay. Culms mostly rather longer than the leaves; lower sheaths transversely striate opposite the leaves: spikes more scattered, forming a very narrow head, the upper aggregated, the lower distinct and oblong (½ inch or less long) and very densely flowered and spreading with a truncate top: perigynium larger, orbicular-ovate, winged, nearly green, spreading at nearly right angles to the rhachis. — Indian Territory and probably southwestward.

* * * * * * *Staminate flowers variously situated, usually some of the intermediate or terminal spikes all staminate, or the plant entirely diœcious: spikes aggregated in more or less chaffy heads, straw-colored or brown.* (The student may seek here No. 72, which has the intermediate spikes staminate, but which is distinguished from all members of this group by its few, erect, and long-lanceolate perigynia.) — ARENARIÆ, Tuckm.

+– *Spikes short: scales ovate, not awned or conspicuously acute.*

67. **C. siccata,** Dew. *Extensively creeping:* culm erect (1 to 2 feet high), sharply angled, rough, mostly longer than the rather narrow leaves: *spikes* 4 *to* 12, *simple, alternate, ferruginous,* longer than the scale-like bracts, *the middle ones or sometimes the lower ones all staminate, loosely aggregated into an oblong or cylindrical head* (which is ¾ to 2 inches long): *perigynium green, nerved, the margins slightly incurved, ovate below, contracted into a rough and slightly toothed beak which is longer than the body, the whole longer than the hyaline-margined acute scale.* — Dry places, Colorado and northward. The forms with the lower spikes all masculine resemble those species of the next section with a single terminal spike which is prolonged and staminate at the base.

68. **C. marcida,** Boott. Culm erect, 1 to 2 feet high, sharply angled, scabrous, longer than the narrow leaves: *spikes* 4 *to* 15, *ferruginous or dark brown, the lower usually somewhat compound, staminate at the apex or nearly diœcious, spreading and imbricated into an oblong-conical or broadly cylindrical head: perigynium brown, becoming very dark at maturity, nerved, ovate or orbicular-ovate, with incurved and serrate margins, contracted into a beak shorter than the body, about the length of, or a little shorter than, the acute or cuspidate scale.* — Sandy meadows and mountains throughout.

69. **C. disticha,** Hudson. *Extensively creeping:* culm *stout,* 1 to 3½ feet high, sharply angled, rough above, mostly longer than the leaves: *spikes* 10 *to* 25, *globose or ovoid, compactly flowered, ferruginous or straw-colored, usually all simple, the middle or terminal ones staminate, loosely aggregated* (the two or three lowest sometimes distinct) *into a cylindrical or oblong thick and heavy*

head (1 to 3 inches long and 3 to 9 lines wide) which is sometimes subtended by a bract of its own length: *perigynium tawny, ovate, prominently nerved, scarcely wing-margined, rough above, shortly beaked* (the orifice nearly entire), bearing a conspicuous fissure on the outer side, *commonly longer than the acute brown scale.* — Dry places, Utah, Colorado, and northward. (Eu.)

70. **C. Gayana,** Desv. *Creeping:* culms *slender* (1 to 2 feet high), longer than the leaves: *spikes* 4 *to* 15, *globose or loosely ovoid, dark brown, simple, nearly diœcious* (rarely staminate at the top), *rather loosely aggregated into a small ovoid head* (8 lines to one inch long): *perigynium triangular-obovoid, about as wide as long* (sometimes wider), *gibbous below, rough on the top, squarely contracted into a very short nearly entire beak, obscurely nerved below, brown and shining at maturity, shorter than the acute chaffy scale.* — Colorado and southward.

+ + *Spikes mostly nearly linear or narrowly oblong, chaffy: the scales long, attenuated or awned: heads pale.*

71. **C. Douglasii,** Boott. Creeping: culm 6 to 12 inches high, obtusely angled and mostly smooth, longer or shorter than the long-pointed leaves: spikes usually many, simple or compound, pale and chaffy, diœcious or nearly so, densely aggregated into a conspicuous and heavy head an inch or two long and often an inch wide, which is sometimes subtended by a setaceous bract of nearly its own length: perigynium ovate-lanceolate, nerved, produced into a slender toothed beak, much shorter and entirely concealed by the long, acute, scarious scale: stamens and stigmas long and conspicuous. — *C. Fendleriana,* Bckler. Var. MINOR, Olney, includes small forms 2 to 6 inches high, with smaller spikes not closely aggregated. Common, especially in Wyoming, Colorado, Utah, and southward. Mature perigynia of this species are rarely seen.

Var. **brunnea,** Olney. Usually taller than the species and more slender (12 to 20 inches high): leaves equalling or exceeding the culm: spikes fewer (3 to 8), the lower distinct, borne in an oblong fuscous head: lower bract short-awned. — Nevada and westward; probably in our region.

§ 15. *Spikes staminate at the base.* (No. 77 is sometimes diœcious, No. 72 has the central spikes staminate or is rarely diœcious, and No. 78 sometimes has spikes staminate at the top.) — HYPARRHENÆ, Anderss.

* *Spikes silvery green or tawny when mature, distinct, mostly small: perigynium not wing-margined nor conspicuously broadened, mostly nearly flat on the inner surface.* — ELONGATÆ, Tuckm.

+ *Perigynium nearly linear or ovate-lanceolate, in loose spikes.*

72. **C. bromoides,** Schk. Cespitose: culms usually *very slender,* 1 to 2 feet high, longer than the narrow and grass-like leaves: *spikes* 4 *to* 8, *becoming tawny with age, erect, loosely aggregated into a narrow and lax head about an inch long, the middle ones usually staminate, or some rarely staminate at top or bottom* (or diœcious), mostly much longer than the inconspicuous scarious bracts: *perigynium linear-lanceolate, contracted below, strongly nerved, erect, attennated into a long rough beak which has a fissure on its outer side, the whole longer than*

the lanceolate and acute scale. — Wet places, Cañon City (*Brandegee*) and Middle Park (*Parry*), Colorado.

73. **C. Deweyana,** Schw. Cespitose: culms weak and slender, 1 to 3 feet high, longer than the flaccid and flat leaves: *spikes* 3 *to* 6, *silvery green,* erect, 4 to 8-flowered, *the two or three upper ones approximate, the lower more or less remote, the lowest subtended by a setaceous bract of more than its own length, all uniformly staminate at the base: perigynium oblong-lanceolate or ovate-lanceolate, very thin in texture, spongy at the base, nerveless or very nearly so, nearly erect, prolonged into a long and rough toothed beak, little longer than the very acute or awned white scale.* — Moist copses throughout.

Var. **Bolanderi,** W. Boott (*C. Bolanderi,* Olney), with stouter culms, 5 to 10 spikes which are mostly 10 to 30-flowered, nerved perigynium, and mostly hispid-awned scales, may be found westward. It occurs in California and Oregon.

74. **C. elongata,** L. Cespitose: culms very slender, 1½ to 2½ feet high, *sharply and roughly angled,* about the length of the *numerous rough-edged leaves: spikes* 8 *to* 12, *oblong, loosely* 8 *to* 30-*flowered, somewhat spreading, loosely approximated into an interrupted head, tawny or brown,* longer than the almost obsolete bracts: *perigynium ovate-lanceolate, firm in texture, strongly many-nerved on both sides, spreading, mostly excurved when mature, narrowed into a nearly smooth rather obtuse point, longer than the obtuse or obtusish broad and white-margined scale.* — "Uinta Mountains, shore of a small subalpine lake near the head of Bear River." (*Olney* in Bot. King Exped.) Readily distinguished by its rusty spikes and spreading strongly nerved perigynia. (Eu.)

+– +– *Perigynium ovate or nearly so, not sharp-margined, firm in texture, erect in closely flowered and rounded spikes.*

75. **C. canescens,** L. Culms slender, 1 to 2 feet high, often weak, rough, about the length or a little longer than the leaves: *spikes* 3 *to* 10, *pale or glaucous, scattered or remote* (the upper usually approximate), *small and densely* 10 *to* 20-*flowered, obovoid or ellipsoid, mostly conspicuously narrowed at the base with staminate flowers: perigynium small, short-ovate or oval, whitish and granular, mostly obscurely nerved, abruptly and minutely beaked, rather longer than the acutish scale.* — *C. curta,* Gooden. Colorado and northward; not common. (Eu.)

Var. **alpicola,** Wahl. *Usually more slender: spikes smaller* (3 to 9-flowered), *usually tawny or brown: perigynium somewhat spreading.* — *C. vitilis,* Fries. *C. canescens,* var. *vitilis,* Carey. Colorado, Utah, and northward. Including a variety of weak, few-flowered forms, and passing by numerous gradations into the species. (Eu.)

Var. **dubia,** Bailey. *Culm stiff* (a foot high), *longer than the long-pointed leaves: spikes* 3 *to* 6, *all approximated at the top of the culm, oblong,* 10 *to* 20-*flowered, light tawny: perigynium gradually narrowed into a beak half as long as the body or more, minutely rough on the angles above, nerved, about the length of or a little longer than the scale.* — Bear River Cañon, Utah (*Watson,* 1231[a]). An imperfectly known variety, much resembling the European *C. helvola,* Blytt, from which it differs in its narrower scales, and in the nerved and rough-angled perigynium.

76. **C. lagopina,** Wahl. *Cespitose: culms* 4 *to* 10 *inches high, erect,* rather longer than the leaves: *spikes usually* 3, *often* 5 *or* 6, *subglobose or ovoid, reddish-brown, compactly flowered, contiguous or the lowest a little remote, all small,* longer than the scale-like bracts: *perigynium small, obovate or elliptical, usually colored above, thick in texture, nerved, tapering towards the base, often curved, rather abruptly short-beaked,* the beak with a closed fissure on the outer side, *longer than the ovate, broad, brown, hyaline-margined acute scale.* — Uinta Mountains, Utah (*Watson*). A small alpine species, distinguished by its heads of few dark-colored spikes, its narrow leaves, and cespitose habit. (Eu.)

+ + + *Perigynium ovate, sharp-margined, firm, often thickened at the base, spreading, in open and at maturity stellate spikes.*

77. **C. echinata,** Murr. Cespitose: culms sharply angled, smooth or rough, slender and erect (6 inches to 2 feet high), usually longer than the narrow, pale leaves: spikes small, about 8 to 15-flowered, scattered, globular, the upper one conspicuously contracted below with staminate flowers, or rarely all the spikes staminate or all pistillate (*C. sterilis,* Willd.): perigynium ovate or ovate-lanceolate, gradually narrowed into a sharp-edged, rough, toothed beak, nerved, spreading or reflexed, about the length of or longer than the acute scale. — *C. stellulata,* Gooden. Var. MICROCARPA, Bcklr. (*C. scirpoides,* Schk., *C. stellulata,* var. *scirpoides,* Carey) includes small and fewer-flowered forms. Twin Lakes, Colorado (*John Wolfe*); also in Arizona and British America. (Eu.)

* * *Spikes tawny or dark, rather large, sometimes crowded: perigynium with a more or less thin or winged margin which is mostly incurved at maturity, rendering the perigynium concave inside.* — OVALES, Kunth.

+ *Spikes aggregated into a more or less dense head.*

78. **C. Bonplandii,** Kunth, var. **angustifolia,** Boott. *Stoloniferous: culm slender and nearly naked* (a foot or more high), *longer than the grass-like leaves: spikes* 3 *to* 6, *small and chaffy, crowded into a small capitate dark brown head* which is a half-inch or less long: bracts scale-like, often setaceously pointed, sometimes inconspicuous, never longer than the head: *perigynium ovate or ovate-lanceolate, somewhat colored, narrowed into a serrate beak about as long as the body, nerved, narrowly winged, about the length of the acutish scale or a little longer and about as wide.* — *C. Bonplandii,* var. *minor,* Olney. Mountains of Colorado and Utah. The species, which is South American, evidently occurs in California, and the *C. tenuirostris,* Olney in herb., collected in Wyoming by C. C. Parry, may be the same. It is lower and stiffer in habit than the variety with larger heads (which are lighter colored) and a greenish perigynium. Forms of this species appear to unite it with the next, but in general they may be distinguished by the narrowly winged perigynium.

79. **C. festiva,** Dew. *Cespitose:* culms usually slender, 6 inches to 2½ feet high, *longer than the flat stem-leaves: spikes* 6 *to* 15, *roundish, small, densely aggregated* (occasionally somewhat loosely) *into a fulvous dark brown or green and brown ovoid head* (which is ¼ to 1 inch in diameter): bract usually inconspicuous, sometimes as long as the head, narrow: *perigynium varying from broad-ovate at base to long-lanceolate, greenish, conspicuously winged* (half its width or more being consumed in the thin margins), narrowed gradually into a

rough beak about as long as the body, *nerved or almost nerveless, longer and broader than the acute or somewhat obtuse brown scale.* — On grassy mountain-sides and alpine summits throughout. A variable and widely distributed species. Through its looser forms it approaches No. 84. (N. Eu.)

Var. **Haydeniana,** W. Boott. *Low* (4 to 8 inches high): *head very dense and dark: perigynium tawny: bracts cuspidate.* — *C. Haydeniana,* Olney. Uinta Mountains, Eastern Utah (*Hayden*).

80. **C. athrostachya,** Olney. Differs from the last in the *presence of elongated bracts which are expanded and strongly nerved at the base, the two or three lower much exceeding the mostly paler head:* lowest spike rarely distinct. — Colorado (*Vasey*) and Upper Flathead River Valley, Montana (*W. M. Canby.*)

+– +– Spikes mostly separated, or if aggregated the individual spikes well defined.

–+ Perigynium thin and scale-like, with little distinction between the margin and the body, mostly greenish.

81. **C. lagopodioides,** Schk. *Culm stout and leafy,* 1½ to 3 feet high, sharply angled, rough above: *sheaths of the leaves dilated: spike* 7 *to* 15 *or more, mostly large,* compactly flowered, *mostly obovoid, not pointed, disposed in a loose and heavy long greenish or straw-colored head:* bracts filiform or none: *perigynium erect, lanceolate, nearly nerveless, with narrow serrate margins, longer than the similarly colored scale.* — New Mexico, near Santa Fé (*Fendler*), and probably northward.

82. **C. cristata,** Schw. Differs from the last in its *smaller size, fewer, smaller, more densely flowered and more aggregated spikes which are globular: perigynium smaller, spreading at right angles or even reflexed,* giving a characteristic cristate appearance to the spikes. — *C. lagopodioides,* var. *cristata,* Carey. Laramie hills, E. Wyoming (*Hayden*), and eastward.

Var. **mirabilis,** Boott, is a form with long and lax culms, *broader, ovate perigynium with the points loosely conspicuous, and the spikes looser flowered.* — *C. mirabilis,* Dew. *C. lagopodioides,* var. *mirabilis,* Olney. Nebraska (*Dewey*), and probably common along our eastern borders. Transition to *C. straminea,* from which it is distinguished by its lax culms and leaves, aggregated and rounded spikes which are green or greenish, and much narrower and thinner perigynia.

83. **C. scoparia,** Schk. Culms rather stiff, about as long as the *very narrow and long-pointed leaves: spikes* 4 *to* 8, *generally aggregated into a close head, club-shaped or ovate, pointed, straw-colored when mature:* perigynium elliptic-lanceolate, *straw-colored:* runs into No. 81. — *C. lagopodioides,* var. *scoparia,* Bcklr. Colorado (Herb. *Olney*), and probably throughout the continent to the east.

–+ –+ Perigynium thickened in the middle, with conspicuous wing-margins which are more or less incurved, mostly tawny or brown.

84. **C. leporina,** L. Cespitose: culms erect, 6 to 16 inches high, scabrous above, mostly longer than the leaves: *spikes* 3 *to* 6, *erect, ovoid, all contiguous into an oblong dark brown head:* lower bracts often green and as long as the head, but usually all scale-like: *perigynium ovate or ovate-lanceolate, broadly*

winged, nerved, rough on the margins, contracted into a beak scarcely as long as the body, the whole not longer than the thin-margined scale. — Colorado, Utah, and northward. (Eu.)

85. **C. Liddoni,** Boott. *Culm erect or nearly so: spikes* 3 *to* 6, *obovoid or oblong, pointed, erect, chaffy at the base, conspicuously fulvous in color, contiguous, or loosely aggregated into an oblong head* (about an inch long): *perigynium large and conspicuous, greenish or tawny, firm in texture, lanceolate* (4 to 6 lines long), *thrice as long as the elliptic brown achenium, few-nerved when mature, rough on the narrowly winged and incurved margins,* very gradually beaked, *about the length of the acute and thin-margined scale.* — *C. adusta,* var. *congesta,* W. Boott. Mostly at high altitudes, South Park, Colorado (*John Wolfe*), and Montana (*F. L. Scribner*); said to occur in Arizona.

86. **C. adusta,** Boott, var. **minor,** Boott. *Culm very slender towards the top, weak and nodding at maturity,* erect when young: *leaves narrow, very long-pointed: spikes all silvery brown, long-attenuated at the base, the lower rather remote: perigynium thin and papery, ovate-lanceolate, nearly nerveless.* — *C. pratensis,* Drejer. South Park, Colorado (*John Wolfe*); also in British America.

87. **C. straminea,** Schk. *Culms erect,* 1 to 2 feet high, *mostly stiff, much longer than the erect long-pointed stem-leaves:* spikes 3 to 8, *all distinct, ovoid or globose, tawny or straw-colored,* mostly approximate at the top of the culm: *perigynium orbicular or ovate-orbicular, often cordate at base, few-nerved, thin, very widely winged, spreading, abruptly contracted into a smooth or nearly smooth beak which is not longer than the body, much wider and usually longer than the acute scale.* — *C. festucacea,* Schk. Vars. *festucacea* and *aperta,* Boott. Dry banks, New Mexico (*Fendler*), Uintas, Northern Utah (*Watson*), Colorado (*Vasey*), Bitter-Root Valley, Western Montana (*Watson*), and eastward; also in British America.

Var. **tenera,** Boott. *Top of the culm slender and somewhat nodding:* spikes more tawny. — *C. tenera,* Dew. Indian Territory (*Geo. D. Butler*).

Order 88. **GRAMINEÆ.** (Grass Family.)

Grasses, with usually hollow stems (*culms*) closed at the joints, alternate 2-ranked leaves, their sheaths split or open on the side opposite the blade; the hypogynous flowers imbricated with 2-ranked glumes or bracts; the outer pair (*glumes* proper) subtending the spikelet of one or several flowers; the inner pair (*flowering glume* and *palet*) enclosing each particular flower, which is usually furnished with 2 or 3 minute hypogynous scales. Stamens 1 to 6, mostly 3: anthers versatile. Styles 2 or 2-parted: stigmas hairy or plumose. Ovary 1-celled, 1-ovuled, forming a seed-like grain in fruit. — Roots fibrous. Sheaths of the leaves more or less extended above the base of the blade into a scarious appendage (*ligule*). See Vasey's *Descriptive Catalogue of U. S. Grasses.*

SERIES I. Spikelets articulated with the pedicel below the glumes, and consisting of one fertile terminal flower, and usually an inferior one which is male or sterile. — PANICACEÆ.

Tribe I. Fertile spikelets perfect, rarely by abortion unisexual, spicate or paniculate: outer glumes usually two, rarely one or none; flowering glume indurated in fruit, or at least more rigid than the outer ones, awnless. — PANICEÆ.

* Branches of the simple panicle spike-like, or variously branched, not produced beyond the spikelets.

1. **Paspalum.** Spikelets in one or two rows along one side of the solitary, subdigitate, or scattered flattened spikes. Glumes 3 (rarely 2), the two outer ones membranous, equal, or sometimes the outer one smaller or disappearing: the flowering glume more or less concave, becoming indurated, embracing the shorter palet, which is of the same texture.
2. **Beckmannia.** Spikelets subsessile, crowded in two rows upon the short simple or compound branches of a long narrow panicle. Glumes 3, sub-coriaceous, obovate or boat-shape, compressed and inflated, empty: the flowering glume lanceolate, acute or acuminate, of thinner texture.
3. **Panicum.** Spikelets spicate or paniculate. Glumes 3 (rarely 2), the two outer ones empty and one of them smaller (often very small) than the other: fertile glume with its palets usually coriaceous in texture and obtuse or obtusish.
4. **Setaria.** Spikelets in a cylindrical spike, or sometimes an interrupted panicle; several bristles below the articulation of the spikelets, which are persistent after the fall of the spikelets. Glumes 3 (rarely 2), the two outer ones empty and membranous, as is also the lower flowering one: the flowering glume, with its palets, indurated and striate.

* * Spikelets surrounded by or intermixed with abortive branches of the panicle, forming a bristly involucre, which is deciduous with the spikelet.

5. **Cenchrus.** Spikelets enclosed 1 to 3 together in a coriaceous, spiny involucre or bur; these arranged in an oblong or cylindrical panicle.

* * * Spikes one to many on a common peduncle, rhachis produced beyond the uppermost spikelet.

6. **Spartina.** Spikelets one-flowered, much flattened, sessile along one side of the long triangular rhachis, or in racemose spikes. Outer glumes strongly compressed, with a rigid keel, unequal, awnless: flowering glume membranaceous, compressed, carinate: palet nearly equalling its glume, 2-keeled.

Tribe II. Spikelets usually perfect, or some of them imperfect, articulated in fascicles with the rhachis of the simple spike: flowering glumes membranaceous; generally the outer or empty ones smaller and hyaline. — ZOYSIEÆ.

7. **Hilaria.** Inflorescence in terminal spikes. Spikelets in small clusters of three, closely sessile at the joints of the rhachis; the central spikelet containing a single fertile flower, either female or perfect; the lateral spikelets each with 2 or 3 male flowers.

Tribe III. Spikelets arranged along the rhachis of the spike or the branches of the panicle generally in twos, or the terminal one in threes. Flowering glume hyaline, smaller than the empty ones, often bearded. — ANDROPOGONEÆ.

8. **Andropogon.** Inflorescence in simple or paniculate spikes. Spikelets in pairs in the alternate notches of the rhachis, one sessile and fertile, the other pedicelled and sterile.
9. **Chrysopogon.** Inflorescence loosely paniculate. Fertile spikelets one-flowered, sessile between two pedicellate sterile spikelets at the end of the slender branches of the panicle, with sometimes 1 to 3 pairs of spikelets on the branch below the terminal three.

SERIES II. Spikelets usually not articulated with the pedicel below the glumes; the rhachis continuous above the persistent lower glumes, and disarticulating with the flowers or persisting; consisting rarely of a single flower, or of one perfect and one or

two inferior imperfect ones, or of from two to many flowers, the upper ones or some of them imperfect. The rhachis sometimes produced beyond the upper flower as a stipe-like pedicel or as an imperfect flower. — POACEÆ.

Tribe IV. Spikelet one to three-flowered, perfect flower solitary and terminal: glumes one-nerved or keeled (sometimes three-nerved in *Phalaris*). — PHALARIDEÆ.

* Rhachis articulated above the outer glumes.

10. **Phalaris.** Spikelets one-flowered, compressed, on the densely flowered branches of a panicle (in ours). Outer glumes acute, boat-shaped, becoming coriaceous or cartilaginous; within these the flower consisting of two glumes, sometimes called palets, enclosing stamens and pistil; below the flower one or two small scales or bristles.

11. **Hierochloa.** Spikelets 3-flowered, in an open panicle: terminal flower perfect, but with only 2 stamens; the two lower flowers male only, each with 3 stamens. Two outer glumes thin and scarious, acutely keeled; glumes of the male flowers thicker, sometimes short-awned, each enclosing a narrow, thin, bifid, two-keeled palet; the upper or perfect flower has a one-nerved glume in place of a palet.

* * Rhachis articulated below the spikelet.

12. **Alopecurus.** Spikelets one-flowered, crowded in a cylindrical spike. Outer glumes strongly compressed, boat-shaped, keeled, nearly equal, frequently united at base; flowering glume shorter, keeled, with a slender dorsal awn, frequently more or less united below by the opposite margins and enclosing the stamens and styles.

Tribe V. Spikelet perfect, one-flowered; rhachis often prolonged beyond the flower as a bristle or stipe. — AGROSTIDEÆ.

* Spikelets paniculate: rhachis not produced beyond the flower: beard of the flowering glume terminal.

13. **Aristida.** Spikelets in a spicate or open branching panicle, generally on filiform pedicels. Outer glumes unequal, often bristle-pointed: flowering glume narrow, rolled around the flower, terminating with a trifid awn, or apparently 3-awned: palet small and thin, enclosed in the flowering glume.

14. **Stipa.** Spikelets terete. Outer glumes membranaceous, keeled: flowering glume narrow, coriaceous, rigid, involute, with a simple twisted awn from the apex: palet small and thin.

15. **Oryzopsis.** Resembling *Stipa*, but the flowering glume shorter and broader, often oblique at top, and the awn usually short, slender and very deciduous.

16. **Muhlenbergia.** Spikelets small, articulated above the glumes. Outer glumes variable in size, from minute to nearly as large as the flowering glume, sometimes bristle-pointed, keeled, persistent, thin: flowering glume 3 to 5-nerved, rigid or thinnish, mucronate or awned, sometimes with a long capillary awn from the apex between the short teeth, frequently pubescent below: palet about as long as the flowering glume and of the same texture.

* * Spikelets in a dense spike-like cylindrical panicle: rhachis produced beyond the flower in a bristle, or naked: flowering glumes awnless, or produced in 1 to 3 straight bristles.

17. **Phleum.** Outer glumes one-nerved, mucronate or short-awned: flowering glume membranaceous, shorter and broader than the outer glumes, truncate and toothed at the apex: palet hyaline, narrow.

* * * Spikelets small, loosely spicate or variously paniculate: rhachis not produced beyond the flower: glumes awnless and beardless.

18. **Sporobolus.** Spikelets rarely 2-flowered. Outer glumes unequal, the lower one shorter, 1 to 3-nerved: flowering glume mostly longer: palet about equalling the flowering glume and of the same texture, 2-nerved.

* * * * Spikelets small, variously paniculate: flowering glume usually with a more or less twisted dorsal awn, rarely mucronate or awnless.

← No bristle standing opposite the palet.

19. **Agrostis.** Outer glumes nearly equal or the lower rather longer, 1-nerved, awnless: flowering glume shorter and wider, hyaline, 3 to 5-nerved, awnless, or sometimes

with dorsal awn: palet shorter than flowering glume, often reduced to a small scale or wanting. Stamens 3.

20. **Cinna.** Spikelets much flattened, in an open spreading panicle. Outer glumes strongly keeled, hispid on the keel, the upper somewhat longer: flowering glume stalked above the outer glumes and about the same length, 3-nerved, short-awned on the back near the apex: palet nearly as long as its glume, one-nerved. Stamen one.

21. **Ammophila.** Outer glumes large, nearly equal, rigid, thick, keeled, 5-nerved: flowering glume similar in texture, about equal in length, sometimes mucronate: palet as long as its glume, of similar texture, 2-keeled and sulcate between the keels. Hairs at the base of the flower usually scanty and short.

+ + A glabrous or hairy bristle standing opposite the palet.

22. **Deyeuxia.** Outer glumes about equal, keeled, awnless: flowering glume usually with a ring of hairs surrounding its base, entire or 2 to 4-toothed, usually with a dorsal awn: palet narrow, 2-nerved and 2-keeled.

Tribe VI. Spikelets 2 to many-flowered, often paniculate: flowering glumes commonly with a dorsal or terminal geniculate awn: rhachis more or less produced beyond the flowers. — AVENEÆ.

23. **Deschampsia.** Spikelets 2-flowered, mostly in a loose panicle with slender branches. Rhachis hairy and produced into a hairy bristle, which rarely bears an empty glume. Outer glumes acute, keeled, with scarious margins: flowering glumes obtuse or toothed, with a fine dorsal awn below the middle: palet prominently 2-nerved, often 2-toothed.

24. **Trisetum.** Spikelets 2 to 5-flowered, in a dense or open panicle. Rhachis usually hairy and produced into a bristle at the base of the upper flower. Outer glumes unequal, keeled, with scarious margins: flowering glumes of similar texture, keeled, 2-toothed at apex, the teeth sometimes prolonged into bristle-like points, the middle nerve furnished with an awn attached above the middle, which is usually twisted at the base and bent in the middle: palet hyaline, narrow, 2-nerved, 2-toothed.

25. **Avena.** Spikelets unusually large, 2 to 5-flowered, the uppermost generally imperfect, in a loose panicle. Rhachis hairy below the flowers. Outer glumes nearly equal, lanceolate, scarious: flowering glumes firmer, shortly bifid, with a long dorsal twisted awn below the apex: palet as in last.

26. **Danthonia.** Spikelets 3 to many-flowered, in a panicle or simple raceme. Rhachis hairy and produced beyond the flowers in a stipe or imperfect flower. Outer glumes narrow, keeled, usually as long as the spikelet: flowering glumes convex on the back, 7 to 9-nerved, with two terminal teeth or lobes, and with a flattish twisted and bent awn between the teeth: palet broad, 2-keeled, obtuse or 2-pointed.

Tribe VII. Spikelets one to many-flowered, sessile and secund in two rows along the rhachis of one-sided spikes. — CHLORIDEÆ.

* One fertile flower in each spikelet.

27. **Schedonnardus.** Spikelets one-flowered, solitary at each joint of the slender triangular rhachis of the paniculate spikes, and partly immersed in an excavation; the spikes alternate and distant. Outer glumes acuminate, unequal, the longer equalling the flowering glume, which is linear-acuminate and thickish at the keel.

28. **Bouteloua.** Spikes numerous in a racemose panicle; spikelets densely crowded, each consisting of one perfect flower, and a stalked pedicel bearing empty glumes and 1 to 3 stiff awns. Outer glumes unequal, acute, keeled: flowering glume broader, usually thicker, with 3 to 5 lobes, teeth, or awns.

* * Two to many fertile flowers in each spikelet.

29. **Buchloe.** Spikelets dicœcious, or rarely monœcious, heteromorphous. — *Male plant.* Spikelets 2 to 3-flowered in 2 or 3 short spikes at the summit of the culm, 5 or 6 closely approximated in each spike. Outer glumes unequal, 1-nerved, the lower one half as long as the flower above it, the upper shorter: flowering glumes and palets of equal length, membranaceous, the former 3-nerved, the latter 2-nerved. — *Female plant.* Spikelets closely approximated in short capitate spikes, which are mostly

near the ground and partly enclosed in the bract-like sheaths of the upper leaves, one-flowered, all the upper glumes indurated and cohering at their bases with the thickened rhachis, the lower glume of the lowest spikelet lanceolate with an herbaceous tip, or 2 to 3-cleft, thickened and adnate to the upper glume, the lower glumes of the other spikelets free, much smaller, membranaceous, one-nerved: flowering glume shorter, 3-nerved, tricuspidate.

Tribe VIII. Spikelets 2 to many-flowered, variously paniculate or rarely racemose: flowering glumes awnless or terminated by one to many awns. — FESTUCACEÆ.

* Glumes 1 to 3-nerved, or rarely many-nerved, 3-toothed, 3-divided, or 3-awned: rhachis glabrous or short pilose.

30. **Triodia.** Spikelets in a strict spicate or open spreading panicle, some of the upper flowers male or imperfect. Outer glumes keeled, awnless: flowering glumes imbricated, rounded on the back, at least below, hairy or smooth, 3-nerved, either mucronate, 3-toothed, or 3-lobed at the apex, or obscurely erose: palet broad, prominently 2-keeled.

31. **Diplachne.** Spikelets narrow, sessile or nearly so, distant on the long slender branches of the panicle, usually in two rows. Outer glumes keeled, awnless: flowering glumes 1 to 3-nerved, with a thin shortly 2-lobed apex, the keel produced into a short point or awn between the lobes: palet thin, prominently 2-nerved.

32. **Triplasis.** Panicle simple and scanty, partly included in the leaf-sheath. Spikelets remotely 2 to 5-flowered. Outer glumes much shorter than the flowers, 1-nerved: flowering glumes 2-lobed or 2-cleft, 3-nerved, strongly fringed on the nerves, the mid-nerve extended into an awn between the lobes: palet shorter, 2-keeled, long ciliate on the keels.

* * Tall grasses with a many-flowered panicle: flowering glumes 3-toothed, or 1 to 3-awned: rhachis or the flowering glumes long pilose.

33. **Phragmites.** Flowers rather distant, silky, villous at the base and with a conspicuous silky-bearded rhachis, all perfect but the lowest flower of the spikelet, which is male and glabrous. Outer glumes narrow, unequal, glabrous, keeled: flowering glumes slender, awl-pointed: palets much shorter, 2-keeled, pubescent on the keels.

* * * Spikelets capitate: flowering glumes 3 to 5-nerved.

34. **Munroa.** Spikelets 2 or 3 together in small sessile leafy heads or clusters terminating the numerous fasciculate and lateral branches, and at the nodes, each about 3-flowered, the upper flower imperfect. Outer glumes shorter than the flowers, 1-nerved: flowering glumes larger, rather rigid, 3-nerved, entire or 2-toothed, the central nerve excurrent in a mucro or short awn.

* * * * Spikelets variously paniculate: flowering glumes mostly 3-nerved, rarely 1-nerved.

35. **Kœleria.** Spikelets 3 to 5-flowered, compressed, numerous in a dense spike-like cylindrical or interrupted panicle. Outer glumes unequal, keeled, lanceolate, about as long as the spikelet: flowering glumes similar, rarely mucronate, the upper one usually smaller and imperfect.

36. **Eatonia.** Spikelets usually 2-flowered and with an abortive rudiment or pedicel, numerous in a contracted or slender panicle, very smooth. Outer glumes unequal; the lower narrowly linear, keeled, 1-nerved; the upper broadly obovate, shorter than the spikelet, not keeled, 3-nerved: flowering glumes oblong, obtuse, chartaceous.

37. **Catabrosa.** Spikelets 2 to 3-flowered, in a loose panicle. Outer glumes unequal, shorter than the flowers; the lower short and narrow; the upper obovate, 3-nerved, erosely-dentate at the apex: flowering glumes obtuse, prominently 3-nerved.

38. **Eragrostis.** Spikelets usually many-flowered, pedicellate or sessile in a loose and spreading or narrow and clustered panicle. Outer glumes unequal and rather shorter than the flowering ones, keeled, 1-nerved: flowering glumes obtuse or acute, unawned, 3-nerved, with prominent keel and the lateral nerves sometimes very faint.

* * * * * Flowering glumes 3 to 5 or many-nerved, more or less involute, the upper two or more empty or imperfect.

39. **Melica.** Spikelets 2 to many-flowered, usually convolute around each other, the upper 1 to 3 smaller and imperfect. Outer glumes awnless, the lower 3 to 5-nerved, the upper sometimes 7 to 9-nerved, the lateral nerves vanishing within the scarious margin: flowering glumes thicker, rounded or flattish on the back, 5 to 9-nerved, the lateral nerves vanishing below the apex, the central one sometimes ending in a point or awn: palets ciliate on keels and apex.

* * * * * * Flowering glumes 5 to many-nerved, the upper one empty, style short, stigmas plumose: leaves generally narrow, without transverse veins.

40. **Distichlis.** Spikelets dicœcious, many-flowered, compressed, crowded in a dense spicate or capitate or rather open panicle. Outer glumes herbaceous, narrow, keeled: flowering glumes rigidly membranaceous or subcoriaceous, keeled: keels of the palet narrowly winged.

41. **Poa.** Spikelets somewhat compressed, usually 2 to 5-flowered, in a narrow or loose and spreading panicle, the rhachis between the flowers glabrous or hairy, the flowers generally perfect, occasionally dicœcious. Outer glumes keeled, 1 to 3-nerved, not awned: flowering glumes 5 to 7-nerved, the intermediate nerves frequently obscure, often with a few loose or webby hairs at the base.

42. **Graphephorum.** Spikelets 2 to 5-flowered, rather terete, in a narrow or loose panicle. Outer glumes nearly equalling the rather remote flowers, keeled, 3 to 5-nerved: flowering glumes rounded on the back or obscurely keeled, faintly or strongly nerved; a tuft of villous hairs at the base of each flower.

43. **Glyceria.** Spikelets several to many-flowered, terete or flattish, in a narrow or diffuse panicle, the rhachis smooth and readily disarticulating between the flowers. Outer glumes unequal, 1 to 3-nerved: flowering glumes obtuse, more or less denticulate at the apex, rounded (never keeled) on the back, 5 to 9-nerved, the nerves separate and all vanishing before reaching the apex.

44. **Festuca.** Spikelets 3 to many-flowered, variously panicled, pedicellate, rhachis not hairy. Outer glumes unequal, the lower 1-nerved, and the upper 3-nerved, narrow and keeled: flowering glumes narrow, rounded on the back, more or less distinctly 3 to 5-nerved, acute or tapering into a straight awn.

45. **Bromus.** Spikelets 5 to many-flowered, in a dense or lax or diffuse panicle, subterete or compressed, the rhachis between the flowers glabrous. Outer glumes more or less unequal, acute, awnless or short mucronate, 1 to 9-nerved: flowering glumes rounded on the back or compressed and keeled, 5 to 9-nerved, acute, or awned from below the mostly 2-cleft apex.

Tribe IX. Spikelets one to many-flowered, sessile on the teeth or excavations of the rhachis of the simple stout spike. — HORDEACEÆ.

* Spikelets solitary at the nodes, 3 to many-flowered, rarely 2-flowered.

46. **Agropyrum.** Spikelets compressed, alternately sessile on the continuous or slightly notched rhachis. Outer glumes nearly equal and opposite, 1 to 3-nerved, scarcely keeled, tapering to a point or awned: flowering glumes similar, rounded on the back, 3 to 7-nerved, pointed or awned from the apex: the two prominent nerves of the upper palet almost marginal and scabrous ciliate.

* * Spikelets two to many at each joint of the rhachis.

47. **Hordeum.** Spikelets 1-flowered, with an awl-shaped rudiment of a second flower, in a dense spike, in clusters of 2 or 3; central spikelet of each cluster perfect and sessile, the lateral ones short-stalked and imperfect or abortive. Outer glumes side by side, two to each spikelet or 6 at each joint, slender and awn-pointed or bristle-form: flowering glume herbaceous, shorter, oblong or lanceolate, rounded on the back, not keeled, 5-nerved, acute or long-awned.

48. **Elymus.** Spikelets 2 to 4 at each joint, sessile, 1 to 6-flowered. Outer glumes two for each spikelet, nearly side by side in its front, forming a kind of involucre for the cluster, narrow, rigid, 1 to 3-nerved, acuminate or awned: flowering glumes herbaceous, oblong or lanceolate, rounded on the back, not keeled, acute or awned.

1. PASPALUM, L.

Ours are perennials, with very obtuse orbicular spikelets and a narrow wingless rhachis.

1. **P. setaceum,** Michx. Stems ascending or decumbent (1 to 2 feet long), slender: leaves and sheaths clothed with soft spreading hairs: spikes very slender (2 to 4 inches long), mostly solitary on a long peduncle, and usually one from the sheaths of each of the upper leaves on short peduncles or included: spikelets narrowly 2-rowed. — Colorado (*Hall & Harbour*), and very common eastward.

2. BECKMANNIA, Host.

A coarse perennial aquatic, with flat scabrous leaves and glabrous sheaths.

1. **B. erucæformis,** Host. Stems stout, 1 to 4 feet high: leaves 4 to 8 inches long; ligules elongated: panicle 4 to 12 inches long, erect, strict, secund, the short crowded branchlets densely flowered from the base: spikelets nearly orbicular, the upper rudimentary floret minute, stipitate. — Widely distributed west of the Mississippi.

3. PANICUM, L. Panic Grass.

Panicle sometimes with the inflorescence crowded upon one side of a narrow rhachis. Grasses of various habits, from low and almost prostrate to stout and several feet high.

* *Spikelets disposed in diffuse and spreading panicles, scattered, awnless.*[1]

†– *Spikelets pointed.*

1. **P. capillare,** L. *Sheaths and usually the leaves very hairy:* panicle half the length of the stem, very open, its long slender branches solitary or in pairs, divaricate when old; spikelets ovoid to narrowly oblong, scattered, on long pedicels: *sterile flower neutral and of a single glume,* twice the length of the acute 1-nerved lower glume; upper glume 5-nerved, pointed, nearly a half longer than the somewhat obtuse perfect flower. — An abundant grass from the Atlantic to the Pacific, mostly in sandy soil. Known as "Old-Witch Grass."

2. **P. virgatum,** L. *Taller* (3 to 5 feet high) *and glabrous: leaves very long, flat:* branches of the compound loose and large panicle at length spreading or drooping; spikelets ovate, scattered, usually purplish: *sterile flower staminate and of a flowering glume and a single palet;* lower glume more than half the length of the upper. — About Denver, and common in the Eastern States.

3. **P. amarum,** Ell. Like the last, but *much smaller, with stems sheathed to the top, leaves involute, glaucous, coriaceous,* the uppermost exceeding the contracted panicle. — Cañon City (*Brandegee*), and in sandy soil along the Atlantic coast.

[1] *P. sanguinale,* L., an introduced species, has spikelets in pairs, one sessile, the other pedicelled, crowded on one side of four or more simple flattened branches digitately clustered at the top of the stem; the lower glume very minute, the upper half the length of the flower. — Appearing late in the season, and known as Crab Grass or Finger Grass.

+ + *Spikelets obtuse.*

4. **P. scoparium,** Lam. Stem geniculate at the lower nodes and at length branched and reclining: *leaves lanceolate, mostly erect and somewhat rigid,* hairy beneath and fringed with spreading hairs at base: panicle nearly simple, with slender hairy branches; *spikelets few, large, tumid, obovate,* usually hairy: *upper glume* 9-*nerved,* twice or three times the length of the lower one: *flowering glume with a transverse fold or furrow near the base.* — *P. pauciflorum,* Ell.? of Gray's Manual. Colorado, Oregon, and eastward to New England.

5. **P. dichotomum,** L. Stem erect and simple, or late in the season decumbent and variously branched: *lower leaves usually ovate, the upper linear-lanceolate,* smooth or hairy or velvety: terminal panicle open, ovoid, *those of the branches short and often included in the sheaths; spikelets oblong-obovate,* smooth or hairy: *upper glume* 5 *to* 7-*nerved,* three times the length of the lower one. — Found everywhere, and exceedingly variable.

* * *Spikelets crowded in* 3 *or* 4 *rows or irregularly on the one-sided spike-like branches of the panicle.*[1]

4. SETARIA, Beauv. Bristly Foxtail Grass.

Annuals, with linear or lanceolate flat leaves. Closely related to *Panicum,* but easily distinguished by the bristly appearance of the spike.[2]

1. **S. setosa,** Beauv., var. **caudata,** Vasey. Stem flattened below, leafy: leaves and sheaths retrorsely scabrous, hairy at the mouth of the sheath, upper leaves involute-pointed: spikes cylindrical, 4 to 6 inches long, often nodding, usually much interrupted below, pale green: bristles upwardly serrulate: perfect flowers ovate, acute, finely punctate. — Grasses U. S. 13. *S. caudata,* R. & S. S. W. Colorado (*Brandegee*) to Arizona, New Mexico, and Texas.

5. CENCHRUS, L. Bur Grass. Hedgehog Grass.

Annual. A troublesome grass, in sandy localities, the spiny heads being deciduous and parting readily from the stem.

1. **C. tribuloides,** L. Stems branching and ascending: leaves flat: panicle of 8 to 20 spherical heads: involucre prickly all over with spreading and barbed short spines, more or less downy. — Found everywhere, especially on the margins of lakes and rivers.

[1] *P. Crus-galli,* L., very widely introduced, possibly indigenous somewhere on the continent, has stems from an inch or two to five feet high, leaves lanceolate and rough on the margins, panicle mostly dense and pyramidal, often tinged with purple, outer glumes rough upon the nerves and abruptly pointed, glume of sterile flower awl-pointed or short-awned, but mostly with a rough awn an inch long or more. — Known as Barn-yard Grass.

[2] The following species, all of which have bristles in clusters and roughened or barbed upwards, are very commonly introduced: —

S. glauca, Beauv., known by its dense tawny yellow cylindrical spike (2 to 4 inches long), 6 to 11 bristles in a cluster, and perfect flower transversely wrinkled. — Foxtail.

S. viridis, Beauv., has a green more or less compound nearly cylindrical spike, few bristles, and perfect flower striate lengthwise and dotted. — Green Foxtail. Bottle Grass.

S. Italica, Kunth, has thick compound yellowish or purplish nodding spikes (6 to 9 inches long) and 2 or 3 bristles in a cluster. — Sometimes cultivated under the name of Millet, or Bengal Grass.

6. SPARTINA, Schreber. Cord or Marsh Grass.

Perennials, with simple and rigid reed-like stems, from extensively creeping scaly rootstocks, very smooth sheaths, and long tough leaves.

1. **S. cynosuroides,** Willd. *Stems* 2 *to* 6 *feet high: leaves* 2 *to* 4 *feet long, tapering to a long slender involute point: spikes* 5 *to* 20, *scattered and spreading,* at least at maturity, *the pedicels and common axis strongly hispid on the angles:* lower glume very narrow; the upper broad, spinulose-hispid on the keel and tapering to a rough awn: the flowering glumes very rough on the midrib which terminates just below its tip. — Across the continent along the borders of lakes and rivers, especially common in the Atlantic States.

2. **S. gracilis,** Trin. *Stems more slender,* 1 *to* 3 *feet high, exceeding the spreading distichous rough and rigid leaves: spikes* 4 *to* 10, *mostly sessile, closely appressed to the nearly smooth rhachis:* outer glumes very unequal, the lower acuminate, the upper acute, they and the flowering glume ciliate and hispid upon the keel. — Steud. Gram. 214. In saline soils from Oregon to Texas, also in Florida.

7. HILARIA, HBK.

Creeping plants, with spikelets so closely sessile as to require some care in their separation.

1. **H. Jamesii,** Benth. Stems 1 to 1½ feet high, hairy at the nodes: leaves glaucous, rigid, scabrous, mostly convolute, the upper ones short and pungent; sheaths scabrous, hairy at the throat; ligule laciniate: spike 2 to 3 inches long, erect: outer glumes of the perfect spikelet ciliate, cleft nearly to the middle, the lobes 1-nerved on the inner margin with 3 to 5 intermediate bristles, the central one longer: flowering glume 3-nerved, bifid: palet 2-nerved, slightly bifid: lower glume of the sterile spikelets slightly 2-cleft, awned above the middle; upper glume emarginate, cuspidate. — *Pleuraphis Jamesii,* Torr. Ann. Lyc. N. Y. i. 148. From Texas and New Mexico to S. Colorado and Nevada.

8. ANDROPOGON, L. Beard Grass.

Coarse, mostly rigid perennials, with lateral or terminal spikes commonly clustered or digitate, the rhachis hairy or plumose-bearded, and often the sterile and staminate flowers also.

1. **A. furcatus,** Muhl. *Tall,* 3 *to* 4 *feet high, the naked summit of the stem terminated by* 2 *to* 5 *rigid digitate spikes:* spikelets approximated, appressed: *hairs* at the base of the fertile spikelet, on the rhachis, and on the stout pedicel of the awnless staminate spikelet *short and rather sparse:* awn of fertile flower long and bent. — In dry sterile soil from Colorado to Texas, and very common in the Atlantic States.

2. **A. scoparius,** Michx. *Stems* 1 *to* 3 *feet high, with numerous paniculate branches: spikes single, scattered, mostly peduncled, very loose,* often purplish, *silky with lax dull white silky hairs shorter than the flowers:* awn of fertile flower twice as long as the flower, twisted or bent. — In S. Colorado and common eastward.

3. **A. saccharoides,** Swz. *Stems slender,* 1 *to* 3 *feet high: spikes in pairs* (or fours) *on short mostly exserted and loosely paniculate peduncles, densely flowered, very silky with long bright white hairs:* fertile flower monandrous, with a capillary awn. — *A. argenteus,* DC. Probably including also (at least in S. Colorado) *A. Jamesii,* Torr. Colorado and southward.

9. CHRYSOPOGON, Trin. Indian Grass. Wood Grass.

A tall simple perennial, with glaucous linear-lanceolate leaves and yellowish or russet-brown and shining spikelets.

1. **C. nutans,** Benth. Stem 3 to 5 feet high, terete: panicle narrowly oblong; the perfect spikelets at length drooping, clothed, especially towards the base, with fawn-colored hairs, lanceolate, shorter than the twisted awn; sterile spikelets small and imperfect, deciduous, or reduced to a mere plumose-hairy pedicel. — *Sorghum nutans,* Gray. Southern Colorado, and common in the Atlantic States.

10. PHALARIS, L. Canary Grass.

Ours is a perennial, with broad flat leaves, branched panicle, and glumes not winged on the back.[1]

1. **P. arundinacea,** L. Stem 2 to 4 feet high, reed-like: outer glumes open at flowering, 3-nerved, thrice the length of the fertile flower: rudimentary flowers reduced to a minute hairy scale or pedicel. — Wet grounds and river banks across the continent, especially northward.

11. HIEROCHLOA, Gmelin. Holy Grass. Vanilla Grass.

Perennials with flat leaves, the dried plants giving off a pleasant vanilla-like odor.

1. **H. borealis,** R. & S. Stem 1 to 2 feet high, with short lanceolate leaves: panicle somewhat one-sided, pyramidal; spikelets chestnut-color: staminate flowers strongly hairy-fringed on the margins; the flowering glume mucronate or bristle-pointed at or near the tip: fertile flower hairy-fringed at the tip. — From California to Colorado and far northward, thence eastward through the northern border States and Canada to Labrador.

12. ALOPECURUS, L. Foxtail Grass.

Perennials, with the flower clusters contracted into a cylindrical and soft dense spike, whence the name.

1. **A. alpinus,** Sm. *Stem erect,* smooth, 6 inches to a foot high: upper leaf much shorter than its inflated sheath: *outer glumes rather acute,* 3-ribbed, covered on the back with long dense white hairs: flowering glume about equalling the outer ones, *the awn exserted more than half its length,* slightly bent but not twisted. — English Fl. i. 81. High mountains of Colorado and northward.

[1] It is probable that *P. Canariensis,* L., is sparingly naturalized within our range, the seed being a favorite food of cage-birds. It may be known by its very dense spike-like panicle and wing-keeled outer glumes.

2. **A. aristulatus,** Michx. *Stem ascending from a decumbent base,* 1 to 2 feet high: leaves glaucous: spike about 2 inches long, slender and very pale green: *outer glumes obtuse,* the flowering one slightly exceeding them, *its awn* attached just below the middle and *barely exceeding it.* — *A. geniculatus,* var. *aristulatus,* Torr. From Colorado to California and Oregon, and eastward across the continent.

13. ARISTIDA, L. Triple-awned Grass.

Stems generally branching; leaves narrow, often involute; spikelets in simple or panicled racemes or spikes; grain linear. All grow in sterile, dry soil.

* *Awns unequal, the middle one longer than the lateral ones.*

1. **A. basiramea,** Engelm. Stems erect, 6 to 15 inches high, slender, much branched at the base, and with short floriferous branches enclosed in the upper leaf sheaths: leaves flat, becoming involute towards the apex, sparsely hairy on the margins below: panicle 1½ to 3 inches long, erect, rather lax, its base sheathed by the upper leaf: glumes linear, unequal, 1-nerved, with a short bristle-like point: flowering glume nearly terete, spotted with black, with a short, acute hairy callus: middle awn about 6 lines long, the lateral ones 4 lines long, spirally twisted below (when mature). — Bot. Gazette, ix. 76. Minnesota, *W. Upham,* and ranging through the prairie region of the Northwest.

* * *Awns about equal in length.*

2. **A. purpurea,** Nutt. *Stem simple,* erect, slender, 6 to 15 inches high: sheaths scabrous, exceeding the internodes, pilose at the throat: *panicle slender,* 3 to 6 inches long, loosely few-flowered: outer *glumes purplish, unequal,* bifid and shortly awned: flower densely short-pilose at the pointed base, scabrous above: *awns 1 to 2 lines long, not exceeding the flower, scabrous.* — Steud. Gram. 134. From Colorado to Texas and westward to the Great Basin.

Var. **longiseta,** Vasey. With very long awns. — *A. longiseta,* Steud. Colorado and southward to New Mexico and Texas.

3. **A. oligantha,** Michx. *Stems tufted,* bearing a *loosely few-flowered raceme:* leaves short: outer *glumes nearly equal,* the lower ones 3 to 5-nerved, nearly an inch long; *awns capillary, 1½ to 3 inches long, much exceeding the slender flower.* — Colorado and southward, thence eastward to Illinois, Virginia, and the Southern States.

14. STIPA, L. Feather Grass.

Perennials, with narrow involute leaves and a loose panicle of early deciduous florets. Some of the species are called "Bunch Grass." The flower has a hardened, often sharp-pointed and bearded pedicel or stipe at its base, the callus.

* *Awn for a part of its length distinctly plumose with silky hairs.*

1. **S. Mongolica,** Turcz. Slender, a foot high, with filiform leaves and a loose few-flowered panicle: glumes membranous, obtuse, about 2 lines long, not quite equal, purplish: flowering glume scarcely shorter, hairy: *the bent awn 6 lines in length.* — Mountains of Colorado.

2. **S. pennata,** L., var. **Neo-Mexicana,** Thurber. — Easily distinguished by the *awns*, which are 6 *inches or more long*, twisted for 1½ to 2 inches below, *the upper part flat and beautifully plumose-pennated.* — Gram. Mex. Bound. ined. Extending into S. W. Colorado from New Mexico and Texas.

* * *Awn not plumose, often strongly pubescent.*

+– *Panicle loose, open.*

3. **S. Richardsonii,** Link. *Stem* 1½ to 2 feet high, *slender: panicle* 4 *to* 5 *inches long*, with slender few-flowered branches; *callus short and blunt:* outer *glumes pointless,* nearly equal, about equalling the pubescent flowering glume; *awn* 6 *to* 8 *lines long.* — Mountains of Montana, *Scribner,* and northward; Manitoba and north shore of Lake Superior, *Macoun;* also in Maine.

4. **S. comata,** Trin. & Rupr. *Stems* 1 *to* 4 *feet high, stout,* mostly scabrous: leaves roughened, the radical ¼ or ⅛ the length of the stem: *panicle* included at base by the upper sheath, 8 *to* 12 *inches long; callus pointed:* outer *glumes* nearly equal, *with a long subulate point:* flowering glume pubescent with coarse hairs: *awn* 4 *to* 6 *inches long,* scabrous especially above, shining, variously curled and twisted. — Watson, Bot. King Exped. 380. From the Upper Missouri to California, New Mexico, and Nebraska.

+– +– *Panicle narrow, contracted.*

5. **S. spartea,** Trin. Stems 1½ to 3 feet high, rather stout: *callus pungently pointed,* villous-bearded (when mature): *glumes lanceolate,* slender subulate-pointed, *greenish,* longer than the palets which are linear and pubescent below. — From Colorado to the Upper Missouri, thence eastward to Illinois and Michigan.

6. **S. viridula,** Trin. Stems 1½ to 5 feet high, with numerous withered sheaths at base: panicle 6 to 18 inches long; *callus very short: glumes ovate,* bristle-pointed, sometimes tinged with purple: *lower palet with short scattered hairs which form a rather irregular crown,* and with 2 very minute hyaline teeth: awn 1 to 1½ inches long, usually twice bent, pubescent below and scabrous above. — Watson, Bot. King Exped. 380. From Colorado to California, Oregon, the Upper Missouri, and British America.

15. ORYZOPSIS, Michx. Mountain Rice.

Perennials, with rigid leaves and a narrow raceme or panicle. Spikelets rather large.

1. **O. micrantha,** Thurber. Leaves linear-setaceous, involute: branches of the panicle in pairs, many-flowered; *spikelets shining, florets smooth,* a little shorter than the linear acutish glumes: *awn about thrice longer than the glumes: anthers naked at apex.* — Steud. Glum. 122. Colorado and southward.

2. **O. cuspidata,** Benth. Stems 1 to 2 feet high, rather rigid and somewhat scabrous: leaves narrow, involute, elongated (2 to 18 inches): *panicle* frequently included at base, *dichotomously branched;* the spikelets solitary upon capillary peduncles: *outer glumes* more or less purple, pubescent, *attenuate-rostrate: flowering glumes rigid, densely covered with long white silky hairs:* the stout nearly straight awn mostly longer: palet rigid: *anthers bearded at apex.* — *Eriocoma cuspidata,* Nutt. From the Sierras eastward to Missouri and Texas.

16. MUHLENBERGIA, Schreb. Drop-seed Grass.

The grain is lance-oblong and drops enclosed in the palets.

* *Panicles contracted or glomerate.*

+ *Flowering glumes barely mucronate or sharp-pointed.*

1. **M. Mexicana,** Trin. Stems ascending, much branched, 2 to 3 feet high: leaves short and narrow: panicles lateral and terminal, often included at the base, the branches densely spiked-clustered, linear: outer glumes awnless, sharp-pointed, unequal, the upper about the length of the very acute flowering glume. — Wyoming and eastward, where it is very common.

+ + *Flowering glume bristle-awned from the tip.*

2. **M. Wrightii,** Vasey ined. Stems erect, 9 inches to a foot high or more: leaves involute, rather rigid and pungently pointed, scabrous, pale; *sheaths much shorter than the internodes: panicle spike-like, 1 to 3 inches long,* the two or three lowest clusters of spikelets somewhat distant: the glumes and palets scabrous, especially on the midribs; lower glume the shorter, ⅓ to ½ the length of the flowering glume, *mucronate pointed;* upper glume longer, 1-*nerved and short-awned: flowering glume* 1-*nerved, tipped by a stout rough awn about* ⅓ *the length of the palet.* — Colorado and New Mexico.

3. **M. gracilis,** Trin. Stems erect, rigid, clothed below with withered sheaths, 6 inches to 2 feet high: leaves filiform, convolute, scabrous, with the whole plant pale; *sheaths longer than the internodes:* panicle 3 to 6 inches long, often bronzed or blackish, *very narrow, the erect rays mostly solitary:* lower glume a little the shorter, more or less acute; the upper half the length of the floret, 3-*nerved, obtuse, erose at apex or with several teeth,* some of them with short awns: flowering glume with a short-bearded minute callus, pubescent, often thickly marked with blackish-green spots, *terminated by a slender roughish awn* 4 *to* 9 *lines long.* — Colorado and southward, thence westward into California.

Var. **breviaristata,** Vasey. Cespitose, low, often growing in ring-like patches: leaves very short and rigid: *panicle short,* 2 *or* 3 *inches long, very close: awn about the length of the flowering glume.* — Rothrock, in Wheeler's Rep. vi. 284. Colorado and eastward.

4. **M. sylvatica,** Torr. & Gray, var. **setiglumis,** Watson. Stems a foot high, nearly erect: *panicle contracted into a glomerate spike;* the branches solitary and densely flowered, mostly to the base: outer *glumes attenuate into a scabrous bristle: flowering glume with its awn about twice longer.* — Bot. King Exped. v. 378. Colorado and Nevada.

5. **M. comata,** Benth. *Stems* 1 to 3 feet high, *smooth* except at the nodes where they are retrorsely pubescent: *leaves flat,* roughish on both sides; lower sheaths equalling the internodes, the upper somewhat shorter: panicle 3 to 4 inches long, *pale green, lead-colored or purplish,* either narrow throughout or lobed below, the lower rays 2 or 3 together, the upper solitary, all very densely many-flowered: outer glumes narrow, very acute, *the lower a little the longer,* serrulate on the keel: *floret with an oblique callus bearing hairs as long as the floret: flowering glume* 3-*nerved, with a long* (3 *to* 4 *lines*), *flexuose, rough, often purplish awn.* — *Vaseya comata,* Thurb. From Nebraska to Colorado, Nevada, and California.

* * *Panicle loose and open.*

6. **M. pungens,** Thurb. Stems erect, from 1 to 1½ feet high: *leaves* very pale green, *hard and rigid, terminated by a hardened point:* panicle very open, its solitary rays fasciculately branched just above the base into long 1-flowered divisions: *outer glumes* half as long as the floret, *pointed by a distinct bristle:* flowering glume acute, *the awn a line long or less: palet with 2 setose teeth, which, nearly equalling the awn, give the appearance of an undeveloped Aristida.* — Proc. Philad. Acad. 1863, 78. From S. California to Arizona, Colorado, and Nebraska.

7. **M. gracillima,** Torr. Cespitose, *glabrous:* stem simple, 6 to 12 inches high: *leaves* very narrow, involute, short, *mostly in radical tufts: panicle* 5 to 6 inches long, *pyramidal,* capillary; branches sub-solitary, widely spreading: spikelets lanceolate, mostly purplish: *outer glumes acute,* scarcely twice shorter than the palets: *flowering glume glabrous, 3-nerved, minutely bifid, with a straight awn of equal length:* callus naked. — Whipple, Pacif. R. Rep. iv. 155. Colorado and southward.

8. **M. Texana,** Thurb. *Stems geniculately decumbent, branching:* panicle few-flowered, rays solitary or in pairs, naked below, at last widely spreading: *outer glumes shorter than the floret,* 1-nerved, *setaceously mucronate: flowering glume and palet pilose, the former terminated by an awn thrice its length* and equalled or exceeded by the latter: callus conspicuous, glabrous. — Gram. Mex. Bound. ined. From Colorado to Arizona and Texas.

9. **M. debilis,** Trin. Stems 3 to 18 inches high, *ascending from a geniculate base, branching from the lower nodes: leaves mostly flat,* acuminate, puberulent on both surfaces, and *with the whole plant purple tinged or dark purple throughout:* panicle 2 to 6 inches long, the few mostly solitary rays spreading, distant, a little longer than the interspaces, included below by the upper sheath; floret very early deciduous: outer glumes ¼ to ⅓ its length, equal or the lower slightly shorter, *the upper or both eroded at the obtuse or truncate apex: flowering glume scabrous throughout, terminated by a slender awn 1 to 1½ inches long.* — S. California to Northern Mexico and extending into S. Colorado and eastward.

17. PHLEUM, L. Cat's-tail Grass. Timothy.

Perennials, with spikes very dense and harsh.[1]

1. **P. alpinum,** L. Culms 1 to 2 feet high: sheaths of the upper leaves very loose or inflated, the lower ones close; ligule short: spike ovoid or oblong, rarely more than an inch long, usually purplish: outer glumes strongly fringed on the back, bearing an awn about their own length. — In alpine regions throughout N. America, Europe, and Asia.

18. SOROBOLUS, R. Br. Drop-seed Grass. Rush Grass.

Stems wiry or rigid. Leaves usually involute and bearded at the throat, their sheaths often enclosing the panicles. Includes *Vilfa,* Beauv.

[1] *P. pratense,* L., the cultivated "Timothy" and frequently naturalized, can be distinguished from *P. alpinum* by its close sheaths, long ligule, much longer spike (1 to 6 inches), and glumes with scarious margins and green keel, which is ciliate with stiff hairs and prolonged into a rigid rough awn shorter than itself.

* *Seed adherent to the pericarp: panicle spiked or contracted.* — VILFA.

1. **S. cuspidatus,** Torr. Root perennial: *stems and leaves very narrow, the latter awl-shaped:* panicle exserted, very simple and narrow: *outer glumes very acute: flowering glume cuspidate.* — *Vilfa cuspidata,* Torr. Colorado and northward; eastward through northern latitudes to Canada and Maine.

2. **S. depauperatus,** Torr. Stems tufted, very slender, 3 *inches to* 2 *feet long, often much branched: leaves very minutely scabrous on the upper surface: panicle* ½ to 2 inches long, *very narrow, of few solitary distant erect rays,* which are branched and flower-bearing nearly to the base: *outer glumes obtuse, nearly equal:* flowering glume and palet nearly equal, the *former obscurely 3-nerved,* often with a minute mucro. — *Vilfa depauperata,* Torr. Varying greatly with the locality. From W. Texas and Mexico to the Saskatchewan, Oregon, and California.

3. **S. Wolfii,** Vasey. *Stems* erect, 1 *to* 1½ *inches high, very slender,* branched at the base: *leaves mostly radical, short, strongly nerved: spikes simple, few-flowered,* terminal and lateral, the lateral ones partly enclosed in the loose sheaths; flowers alternate, pointed: *outer glumes* membranaceous, *obtuse:* flowering glume and palet nearly equal in length. — *Vilfa minima,* Vasey, Bot. Wheeler Exped. 283. About Twin Lakes, Colorado.

4. **S tricholepis,** Torr. *Stems erect, simple,* terete, 9 *to* 18 *inches high,* tufted: *leaves glabrous:* branches of the *oblong rather dense panicle* alternate; pedicels longer than the spikelets: *outer glumes* nearly equal, *acutish,* ¼ shorter than the *nearly equal pilose* flowering glume and *palet:* flowering glume 3-nerved. — *Vilfa tricholepis,* Torr. Colorado and southward.

* * *Seed free from the pericarp: panicle generally open.*

+– *Outer glumes very unequal.*

5. **S. cryptandrus,** Gr. Stems 2 or 3 feet high, usually geniculate and branched below: *leaves flat,* acuminate, scabrous especially above; *sheaths strongly bearded at throat: panicle narrowly pyramidal,* more or less enclosed by the upper sheath, 4 to 8 inches long, its *rays* mostly in pairs, *flower-bearing to the base: spikelets lead-colored,* short-pedicelled: outer glumes somewhat acute. — *Vilfa cryptandra,* Trin. From Texas and New Mexico to Colorado and Oregon, and eastward to New England.

6. **S. airoides,** Torr. Stems forming large tufts, clothed below by the dead sheaths, 2 to 3 feet high, somewhat rigid, smooth: *leaves very pale, convolute* and tapering to a filiform apex; *sheaths with a few long hairs at the throat: panicle broadly pyramidal,* soon exserted, 6 to 12 inches long, *its rays* solitary or in pairs, *naked below: spikelets brownish,* on rather long pedicels: outer glumes rather obtuse. — Marcy's Rep. 300. *Vilfa airoides,* Steud. California to Nebraska and southward to New Mexico and Texas.

+– +– *Outer glumes nearly equal.*

7. **S. ramulosus,** Kunth. Stems tufted, 3 to 8 inches high, very slender and branched below: *leaves* flat or involute, *scabrous on the margins: panicle very long for the size of the plant, constituting* ¾ *of its height, the capillary few-flowered mostly solitary rays* rather distant and spreading, *the secondary branches* 1 *to* 2 *flowered: spikelets less than* ½ *line long: outer glumes mostly ciliate-fringed on the margin.* — *Vilfa ramulosa,* HBK. From Colorado to Texas, New Mexico, and California.

8. **S. asperifolius,** Thurb. Stems 6 to 15 inches long, branched, decumbent at base and forming broad matted tufts: *leaves* flat, *scabrous, especially on the margins and upper surface: panicle included at base,* 3 *to* 5 *inches long,* pyramidal or ovoid in outline, *the scabrous rays solitary or in pairs, bearing* 3 *to* 4*-flowered capillary branches: spikelets less than a line long: outer glumes minutely scabrous.* — Bot. Calif. ii. 269. *Vilfa asperifolia,* N. & M. From Nebraska to Texas, Mexico, California, and Oregon.

19. AGROSTIS, Linn. Bent Grass.

Mostly perennials, with slender low culms which form dense tufts. Ours are strictly one-flowered.

* *Palet present.*

1. **A. alba,** L. Stems varying from a few inches to 2 feet high, sometimes decumbent at base: *leaves* flat, *short, smooth or roughened; ligule short and truncate or long and acute: panicle slender, usually spreading when in flower and more or less contracted afterwards,* green, purplish, or brownish: flowering glume very thin, 3 or 5-nerved, rarely with a short awn: *palet* $\frac{1}{3}$ *to* $\frac{1}{2}$ *the length of the flowering glume.* — Includes *A. vulgaris,* With. Found in all cultivated regions. *A. vulgaris* differs from *A. alba* principally in the ligule of the former being short and truncate and that of the latter elongated and acute, hence they are both here included under the older name of *A. alba.* The form *vulgaris* is often called "Red-top."

2. **A. exarata,** Trin. Stem erect, 1 or 2 feet high or more, at length naked for some distance below the panicle: leaves mostly erect and flat, *the radical* 2 *to* 4 *and those of the stem* 6 *inches long* or more, *roughish or very rough; ligule obtuse,* more or less decurrent: *panicle* erect, *rather narrow, dense to very dense and crowded,* pale greenish, rarely tinged with purple: flowering glume $\frac{1}{3}$ to $\frac{1}{2}$ shorter than the outer glume, 4 to 5-nerved, and marked on the back by a longitudinal furrow, sometimes awned above the middle: *palet usually shorter than the ovary, sometimes longer.* — Common west of the Mississippi and exceedingly variable, so much so that many forms described as distinct species must be included under it.

* * *Palet entirely wanting or very minute.*

+ *Spikelets awnless or short-awned.*

3. **A. perennans,** Tuckm. Stems slender, 1 to 2 feet high: *leaves flat: panicle at length diffusely spreading, pale green; the branches short, divided and flower-bearing from or below the middle.* — In Montana and Wyoming, and very common eastward. Called "Thin Grass."

4. **A. scabra,** Willd. Stems very slender, 1 to 2 feet high: *leaves short and narrow, the lower soon involute: panicle very loose and divergent, purplish, the long capillary branches flower-bearing at and near the apex.* — Common throughout the whole continent. Called "Hair Grass" or "Fly-away Grass."

+ + *Spikelets awned.*

5. **A. canina,** L. Stems $\frac{1}{2}$ to 2 feet high: root-leaves involute bristle-form, those of the stem flat and broader: panicle 2 to 6 inches long, spreading, the unequal rays in clusters of five below, in pairs or solitary above, roughened, branching above the middle: spikelets purple or brownish:

flowering glume exsertly awned on the back at or below the middle. — Found everywhere, and very variable, the mountain forms especially bearing many names. Known as "Brown Bent Grass."

20. CINNA, L. Wood Reed Grass.

A perennial grass, with simple and upright somewhat reed-like stems, 2 to 7 feet high, bearing an ample compound terminal panicle, its branches in fours or fives; the broadly linear-lanceolate flat leaves with conspicuous ligules.

1. **C. arundinacea,** L., var. **pendula,** Gray. Stem smooth, with conspicuous brownish nodes: leaves rough on both sides and margins: panicle 8 to 12 inches long, drooping at apex, the capillary rays clustered, distant, flexuose, very unequal, the longer flower-bearing above the middle, very scabrous. — California and northward, thence eastward through Montana to the northern border States.

21. AMMOPHILA, Host.

Perennials, with stout stems from thick running rootstocks. This is represented in Gray's Manual by the *Calamovilfa* and *Ammophila* sections of *Calamagrostis*.

1. **A. longifolia,** Benth. Stems 1 to 4 feet high: leaves rigid, elongated, involute above and tapering into a long thread-like point: branches of the pyramidal panicle smooth: the copious hairs more than half the length of the naked flowering glume and palet. — *Calamagrostis longifolia,* Hook. From Colorado northward, thence eastward to Michigan and Illinois.

22. DEYEUXIA, Clarion. Reed Bent Grass.

Perennials with running rootstocks and mostly tall erect and rigid stems. This genus includes all the species of *Calamagrostis* in the section *Deyeuxia.*

* *Panicle loose and open.*

1. **D. Canadensis,** Beauv. Stems tall, erect, smooth, 3 to 5 feet high: leaves about a foot long, flat, minutely scabrous: panicle 4 to 6 inches long, oblong, the common axis and rays scabrous: spikelets 1¼ to 1¾ lines long: *outer glumes lanceolate, acute:* flowering glume nearly as long, surrounded by copious white hairs, and *awned* on the back from near the middle *with a very delicate bristle not much stouter than the hairs,* and usually barely equalling or rarely slightly exceeding the palet. — *Calamagrostis Canadensis,* Beauv. From New Mexico northward and across the continent.

2. **D. Langsdorffii,** Trin. Closely resembling the last, but distinguished by its *longer spikelets* (2 to 3 lines), *attenuate-acuminate outer glumes,* which are often cinereously strigose-pubescent, and its *stouter and usually exserted awn.*

* * *Panicle narrow, the erect branches appressed after flowering.*

3. **D. Lapponica,** Trin. Stem about a foot high: *radical leaves nearly as long; stem leaves much shorter and divergent,* all convolute, rigid and strongly

striate, *rough above and on the margins: panicle* an inch or two long, *very dense:* outer glumes ovate, acute: flowering glume acute, lacerate-fringed, with numerous delicate basal *hairs longer than in the next; awn very slightly exceeding the glume, attached just above the base, straight.* — *Calamagrostis Lapponica,* Trin. Rocky Mountains of Wyoming and northward to Alaska.

4. **D. stricta,** Trin. Stem taller: *leaves mostly setaceously involute,* erect, *scabrous on both sides: panicle* at first included at base, at length exserted, 2 to 5 inches long, narrow, *somewhat lobed,* interrupted below: outer glumes ovate-oblong, acute, rough upon the keel and minutely scabrous all over: *flowering glume bearing the straight awn at or below the middle and slightly exceeding it; the hairs at the base about two thirds the length.* — *Calamagrostis stricta,* Trin. From the mountains of Colorado to California, and eastward along the northern border to Vermont and Canada.

5. **D. sylvatica,** DC. Stems 1 to 2 feet high, *clothed at base by crowded dead sheaths:* radical leaves reaching nearly to the panicle; stem leaves gradually becoming shorter, all attenuate-pointed, more or less scabrous and involute: *panicle* enclosed at base when young, *spike-like,* 3 or 4 inches long, *very dense;* rays mostly in fives, appressed and like the rhachis very rough: outer glumes ovate-lanceolate, very acute: flowering glume acute, 4-toothed, grooved on the back, *its awn attached very near the base, twisted and rough below, bent at the middle, and exserted more than half the length of the glumes; hairs unequal, the longest at the sides about ¼ as long as the glume.* — *Calamagrostis sylvatica,* DC. Mountains of Colorado, thence northward and westward.

23. DESCHAMPSIA, Beauv. Hair Grass.

Perennials, formerly included under *Aira* as a subgenus. The flowering glume is delicately 3 to 5-nerved, and the grain is free.

* *Outer glumes barely equalling and mostly shorter than the florets.*

1. **D. flexuosa,** Beauv. Stem slender, 1 to 2 feet high, nearly naked above the small tufts of *involute bristle-form root-leaves* (1 to 6 inches long): panicle small and spreading, its branches capillary: *awn longer than the glume, at length bent and twisted.* — *Aira flexuosa,* L. Mountains of S. W. Colorado (*Brandegee*) and northward; common in the Atlantic States.

2. **D. cæspitosa,** Beauv. Stem tufted, 2 to 4 feet high: *leaves flat and linear:* panicle 6 inches long, pyramidal or oblong: *awn straight, barely equalling the glume.* — *Aira cæspitosa,* L. Across the continent and northward to Alaska. Very variable, especially the mountain forms. The dwarf mountain plant, 6 or 8 inches high, with a tuft of short setaceous leaves, is var. *arctica.*

* * *Outer glumes longer than the florets.*

3. **D. danthonioides,** Munro. Stem slender, from a few inches to 2 feet high: *leaves very narrow:* panicle very loose and open: *outer glumes linear-lanceolate: flowering glume with hairs at base ⅓ as long,* shining below; *awn inserted just below the middle,* about 3 times its length, light brown, twisted below and geniculate near the middle. — *Aira danthonioides,* Trin. From Texas to Colorado, California, and Oregon.

4. **D. latifolia,** Hook. Stem 1 to 2 feet high: *lower leaves* 2 or 3 inches long, *about* 3 *lines wide,* flat and smooth: panicle with a few slender rays, which are densely flowered above: *outer glumes ovate-lanceolate: flowering glume with silky hairs* ½ *as long or more; awn stout, attached just above the middle,* somewhat divergent, exceeding the flowering glume but included by the outer ones. — *Aira latifolia,* Hook. In the Northern Rocky Mountains, and westward into Oregon and Washington Territory.

24. TRISETUM, Pers.

Perennials, resembling the next genus and by some made a section under it. Ours have a dense and spike-like panicle, and a smooth ovary.

1. **T. subspicatum,** Beauv. Stems tufted, 4 inches to 2 feet high, smooth or downy: leaves flat and smooth, or with the loose sheaths pubescent: panicle 2 to 6 inches long, dense and oblong-ovate, or elongated and several times interrupted below: lower glume shorter, the upper about equalling the florets, both ciliate on the keel: flowering glume with a divergent awn about its own length. — In the mountains from Colorado to California and northward; eastward along the northern border to New England.

Var. **molle,** Gray. Stem and foliage minutely soft-downy. — Man. 641. Same range.

25. AVENA, L. Oat.

The grain is oblong-linear, grooved on one side, hairy throughout or at the tip only, free but closely invested by the palet.

1. **A. striata,** Michx. Glabrous and smooth throughout, slender, 1 to 2 feet high: leaves narrow: panicle simple, loose, with spikelets on capillary pedicels: lower glume 1-nerved; the upper 3-nerved: flowers short-bearded at base; the soon bent or divergent awn inserted just below the tapering very sharply cuspidate 2-cleft tip of the palet. — Colorado (*Hall & Harbour*), and in the mountains of New York and New England.

26. DANTHONIA, DC. Wild Oat Grass.

Ours are perennials, with narrow leaves, hairy sheaths, and a small simple panicle or raceme.

1. **D. Californica,** Boland. Stems sometimes decumbent at base, from ½ to 3 feet high: leaves, especially the lower, convolute and setaceously pointed, with sheaths bearded at the throat: *panicle mostly a simple raceme:* outer glumes mostly purplish with scarious margins, pointed, the upper 5 to 7-nerved: *flowering glume broad, its teeth about half its own length, with marginal tufts of long silky hairs at or below the middle;* awn about equalling the glume. — Proc. Calif. Acad. ii. 182.

Var. **unispicata,** Thurber. Stems 6 inches high or less, *from dense tufts of somewhat hairy leaves, the sheaths of which are densely villous with white spreading hairs, arising in small clusters from white minute papillæ: spikelet solitary and terminal* (rarely 2 or 3). — Bot. Calif ii. 294. Both forms occur in the Rocky Mountains, the Wahsatch, and westward to California and Oregon.

2. **D. sericea,** Nutt. Stems not tufted, 1 to 3 feet high: leaves narrow, with *sheaths silky-hairy at the throat: panicle narrow,* the lower rays sometimes 2 to 3-flowered and spreading: outer glumes acuminate, much exceeding the florets: *flowering glumes with very long teeth, and villous with long silky hairs all over or only below and on the margins.* — Gray, Man. 640. Colorado to California; also eastward in the Atlantic States.

27. SCHEDONNARDUS, Steud.

Low and branching, often procumbent, chiefly annuals, with narrow leaves and slender spikes.

1. **S. Texanus,** Steud. Stems ½ to 2 feet high, leafy below, naked and curved above: panicle of 3 to 10 recurved second distant spikes, 3-angled and rough: outer glumes suddenly narrowing to awn-like points: flowering glume but partly covered by the outer ones. — *Lepturus paniculatus,* Nutt. From Illinois to Texas, Colorado, and California.

28. BOUTELOUA, Lag. Grama Grass.

Very slender grasses, often geniculate at base, with short leaves less than a line broad, and ligule a hairy fringe. — Watson in Proc. Am. Acad. xviii. 178.

§ 1. *Spikes two or more, linear or oblong, more or less falcate, the usually very numerous spikelets pectinately crowded on one side of the rhachis: terminal empty glume usually 3-awned.*

* *Lower glumes villous.*

1. **B. hirsuta,** Lag. Tufted, 8 to 20 inches high: *leaves flat, lance-linear,* papillose hairy or glabrous: spikes 1 to 4, oblong-linear, very dense: *upper glume hispid* with strong bristles *from dark warty glands:* flowering glume pubescent, 3-cleft: *sterile glume and its pedicel glabrous,* the 3 awns longer than the glumes and fertile flower. — Colorado to Mexico, and eastward to Texas and Illinois.

2. **B. oligostachya,** Torr. Glabrous, 6 to 18 inches high: *leaves very narrow:* spikes 1 to 5, oblong-linear, very dense: *glumes sparingly soft-hairy: pedicel of the sterile glume copiously villous-tufted at the summit;* the 3 awns equalling the larger glume. — Gray, Man. 621. From the Saskatchewan to Texas, Mexico, and S. California.

* * *Lower glumes glabrous.*

3. **B. polystachya,** Torr. Stems 3 to 15 inches long: leaves scabrous: *spikes* 3 to 6 or more, *narrowly linear, dense,* the scabrous rhachis hispid-ciliate: *flowering and sterile glumes 3-awned,* with usually broad lobes between the awns. — Pacif. R. Rep. v. 366. From S. Colorado to S. California, Mexico, and Texas.

4. **B. eriopoda,** Torr. *Spikes more loose and slender: flowering and sterile glumes 1-awned,* bearded at base: *peduncle villous.* — S. Colorado (*Brandegee*) to New Mexico and W. Texas.

§ 2. *Spikes numerous, usually short, straight, not pectinate, in a long and virgate one-sided spike or raceme: terminal empty glume rudimentary.*

5. **B. racemosa,** Lag. Stems tufted, 1 to 3 feet high: leaves narrow: spikes ½ inch long or shorter, nearly sessile, 30 to 60 in number in a loose general spike (8 to 15 inches long): sterile glume reduced to a single small awn, or mostly to 3 awns shorter than the flower. — *B. curtipendula,* Torr. From Colorado and Arizona to Texas and northeastward.

29. BUCHLOË, Engelm. Buffalo Grass.

A densely tufted grass, forming broad mats and spreading by stolons: stems of the female plant much shorter than those of the male. The two forms, at first described as different genera, were shown to be related by Dr. Engelmann.

1. **B. dactyloides,** Engelm. Flowering stems of the male plant 4 to 6 inches long, glabrous or slightly hairy: leaves 2 to 4 inches long: spikelets alternate in 2 rows, uppermost abortive, bristle-form: stems of the female plant much shorter than the leaves, 1½ to 2 inches high. — Trans. St. Louis Acad. i. 432. On the elevated plains from British America to Texas and New Mexico. One of the many "Buffalo Grasses," but probably one of the most widely distributed and valuable grasses of the plains.

30. TRIODIA, R. Br.

Stems tufted: leaves very narrow and taper-pointed; sheaths bearded at the throat: panicle simple or compound; spikelets often racemose, purplish.

1. **T. mutica,** Benth. *Stem* rigid, erect, *very simple,* a foot high: *leaves* convolute-filiform, 3 *to* 6 *inches long:* panicle much exserted, racemose, with short appressed branches; *spikelets* 5 *to* 8*-flowered: outer glumes rather acute,* scarcely half the length of the florets: *flowering glume awnless, entire or bifid, long-ciliate on the margin and back.* — *Tricuspis mutica,* Torr. Bot. Whipple, 156. From Texas to Arizona, and extending into S. Colorado.

2. **T. pulchella,** HBK. *Stems* crowded, wiry, 2 to 6 inches high, *fasciculately branched above:* leaves setaceously convolute, rigid, scabrous; *radical leaves crowded, an inch long;* upper leaves shorter, the uppermost even appearing like large awned glumes: panicle of about 3 *spikelets,* 6 *to* 7*-flowered: outer glumes* white, *acuminate or subulate-pointed,* the upper slightly exceeding the lower and the florets: *flowering glume* white, *densely silky-villous to near the middle, deeply bifid, with a strong awn* slightly exceeding the obtuse lobes. — *Tricuspis pulchella,* Torr. Pacif. R. Rep. iv. 156. From W. Texas to S. Colorado, Utah, Arizona, and S. California.

3. **T. acuminata,** Benth. *Stems simple,* 6 inches or more high, usually with but a single node, which bears a very short leaf: *radical leaves an inch or two long;* those of the stem shorter: *panicle dense, ovoid,* 1 to 2 inches long, with a few erect branches; *spikelets* 8 *to* 12*-flowered: outer glumes acuminate,* the upper subaristate: *flowering glume scarcely bifid, with a central seta* ¼ *its length, densely silky below,* with a conspicuously silky tuft near the

base. — *Tricuspis acuminata*, Munro. From Texas to Arizona, and extending into S. Colorado.

31. DIPLACHNE, Beauv. Slender Grass.

Ours are annuals, with flat leaves and geniculate-decumbent and branching stems.

1. **D. fascicularis,** Beauv. Smooth: leaves longer than the stems, the upper sheathing the base of the crowded panicle-like raceme, which is composed of many strict spikes: spikelets short-pedicelled, 7 to 11-flowered: flowering glume hairy-margined towards the base, with two small lateral teeth as well as the short awn. — *Leptochloa fascicularis*, Gray, Man. 623. From New England across the continent.

32. TRIPLASIS, Beauv. Sand Grass.

A tufted grass, with numerous bearded joints, and short involute-awl-shaped leaves.

1. **T. purpurea,** Chap. Stems ascending, 6 to 12 inches high: panicles very simple, of few spikelets, the terminal one usually exserted, the axillary ones included in the commonly hairy sheaths: awn much shorter than its glume, seldom exceeding the eroded-truncate or obtuse lateral lobes. — *Tricuspis purpurea*, Gray. Colorado (*Hall & Harbour*); about the Great Lakes and along the Atlantic coast.

33. PHRAGMITES, Trin. Reed.

Tall and stout perennials, with numerous broad leaves and a large terminal panicle, the silky hairs of the rhachis becoming very conspicuous as the seed ripens.

1. **P. communis,** Trin. Stems 5 to 12 feet high: panicle loose, nodding; spikelets 3 to 5-flowered; flowers equalling the wool. — Found everywhere along the margins of streams and ponds. Looks like Broom-Corn at a distance.

34. MUNROA, Torr.

Creeping annuals, very much branched from the base, with fasciculate branches.

1. **M. squarrosa,** Torr. Leaves 1 to 2 inches long, flat, 1 to 2 lines wide, somewhat pungent, scabrous on the margin: spikelets mostly 3: glumes almost unilateral, linear-lanceolate, keeled. — Bot. Whipple, 158. On the plains.

35 KŒLERIA, Pers.

Tufted grasses, with simple upright stems: the sheaths often downy.

1. **K. cristata,** Pers. Panicle narrowly spiked, interrupted or lobed at the base: spikelets 2 to 4-flowered: flowering glume acute or mucronate: leaves flat, the lower sparingly hairy or ciliate. — From California and Oregon eastward to Pennsylvania.

36. EATONIA, Raf.

Perennial, slender grasses, with simple and tufted stems, and often sparsely downy sheaths, flat lower leaves, and small greenish (or purplish) spikelets.

1. **E. obtusata,** Gray. Panicle dense and contracted, somewhat interrupted, rarely slender: spikelets crowded on the short erect branches: upper glume rounded-obovate, truncate-obtuse, rough on the back. — Manual, 626. Across the continent, occurring most abundantly in the southern part of our range.

37. CATABROSA, Beauv.

Glabrous creeping aquatics, with flat leaves, elongated membranous ligules, and diffusely branched panicles with semi-verticillate branches: flowers jointed at base and deciduous.

1. **C. aquatica,** Beauv. Stems 4 inches to 2 feet high, rather stout, ascending: leaves 2 to 6 inches long, 2 to 4 lines wide, scabrous on the margin: panicle uniform, branchlets numerous, divided: flowers light-brown: glumes purplish. — In the Rocky Mountains.

38. ERAGROSTIS, Beauv.

Stems often branching: leaves linear, frequently involute, and the ligule or throat of the sheath bearded with long villous hairs.[1]

1. **E. Purshii,** Schrad. Sparingly branched at the decumbent base, then erect, ½ to 2 feet high: leaves narrow, flat and soft: panicle elongated, the branches widely spreading, very loose; spikelets 5 to 18-flowered, oblong-lanceolate, at length linear, mostly much shorter than their capillary pedicels: glumes ovate and acute, the flowering glume 3-nerved. — From Nevada, Colorado, and New Mexico eastward to New Jersey.

39. MELICA, L. Melic Grass.

Perennials with soft and flat leaves: panicle simple or sparingly branched; the rather large spikelets racemose-one-sided. Ours belong to § Eumelica, in which the spikelets are 4 to 8 lines long, with 2 to 8 perfect florets; flowering glume apparently many-nerved below (at least when dry), with a broad scarious margin above. — Scribner, Proc. Philad. Acad., 1885, p. 40.

* *Stems not bulbous at base.*

1. **M. Porteri,** Scribner. Panicle narrow, the slender branches erect, or the lower slightly divergent, the pedicels flexuose or recurved, densely pubescent: empty glumes very unequal and decidedly shorter than the 3 to 5-flowered spikelets. — Rusby's Arizona Plants. *M. mutica,* var. *parviflora,* Porter.

[1] *E. poæoides,* Beauv., var. *megastachya,* Gray, is a very common introduced species, and may be recognized by its large, short-pedicelled, densely-flowered (10 to 50), flat, lead-colored spikelets, which become linear and whitish when old, forming a narrow crowded panicle; its diffusely spreading habit, and its mostly glabrous sheaths. It is said to emit an unpleasant odor.

E. pilosa, Beauv., is another introduced species, like *E. Purshii* in general habit, but may be distinguished by its spikelets about equalling their pedicels, its obtuse glumes, and the 1-nerved flowering glume.

M. stricta of Brandegee's Fl. S. W. Colorado. From Colorado to Arizona, New Mexico, and Texas.

* * *Stems usually bulbous at base.*

+ *Second glume decidedly shorter than the third.*

2. **M. spectabile,** Scribner. Panicle nodding, loosely few-flowered, the slender branches erect spreading: terminal floret acute: flowering glume very broadly acuminate, obtuse or notched at the tip. — Proc. Philad. Acad., 1885, p. 45. *M. bulbosa* of Bot. King Exped., and Fl. Colorado. This differs from *M. bulbosa*, Geyer, in its usually taller and more slender stems, more open and nodding panicle, more slender and flexuose pedicels, shorter empty glumes, and broader flowering glumes which taper abruptly to a rounded and usually two-lobed summit. In the mountains, from Colorado and Utah to Montana and Idaho.

+ + *Second glume as long as the third.*

3. **M. Californica,** Scribner. Panicle erect, *densely many-flowered*, branched below, spicate above; *spikelets about* 4 *lines long, with about three perfect florets, the rudimentary one obtuse.* — Loc. cit. p. 46. *M. bulbosa* of Bot. California. From the Upper Yellowstone (*T. C. Porter*), where the stem may lack the bulbous character, to California.

4. **M. bulbosa,** Geyer. Stems singly or densely tufted, usually about 2 feet high, simple: sheaths and upper surface of the leaves scabrous: panicle erect, the branches appressed, *few-flowered; spikelets* 5 *to* 6 *lines long, with* 5 *to* 8 *perfect flowers, the terminal floret acute.* — From Utah and Montana to Oregon and Washington Territory.

40. DISTICHLIS, Raf. Spike Grass.

Perennials with widely creeping rootstocks and short stems clothed to the top with crowded sheaths: leaves rigid, mostly involute: pistillate spikelets much more rigid than the staminate.

1. **D. maritima,** Raf. Stems 6 to 18 inches high, sometimes branched below: leaves about 4 inches long, usually distichously spreading, long-acuminate: spike oblong, 1 to 3 inches long; spikelets 5 to 12-flowered. — Journ. Phys. lxxxix. 104. *Brizopyrum spicatum*, Hook. & Arn.

Var. **stricta,** Thurber. Leaves setaceously-convolute: panicle loose; spikelets few, erect, often an inch long, 10 to 20-flowered. — Bot. Calif. ii. 306. From Mexico northward throughout the Rocky Mountains, and westward to California.

41. POA, L. Meadow Grass.

Stems tufted from mostly perennial roots: leaves smooth, usually flat and soft.

§ 1. *Flowering glume rounded on the back, obtuse.*

1. **P. Californica,** Munro. Densely tufted perennial, its somewhat rigid stems 4 inches to 2 feet high: *radical leaves about half as long as the stem, mostly flat;* stem-leaves short, the uppermost often reduced to a mucro: panicle 2 or 3 inches long, narrow or linear, or with the rays spreading; spikelets 3 to

7-flowered: outer glumes acute, rough on the back: *flowering glume with a broadly scarious irregularly erose apex, the lower half of the middle and marginal nerves usually silky-pubescent.* — *P. andina*, Nutt., not of Trin. From California to Wyoming, Colorado, and southward.

2. **P. tenuifolia,** Nutt. Stems very slender, densely tufted, 1 to 2 feet high, the foliage glabrous or scabrous: *radical tufts 3 or 4 inches high, of exceedingly narrowly linear mucronate-pointed leaves;* stem-leaves scarcely wider: panicle 2 to 6 inches long, the erect rarely spreading distant rays mostly in threes; spikelets mostly 3-flowered: outer glumes very acute, rough on the midnerve: *flowering glume narrowly lanceolate,* often erose at the apex, *puberulent or with a few scattered hairs near the base.* — From Colorado to California and Oregon. One of the most valuable of the "Bunch Grasses."

§ 2. *Flowering glume compressed-keeled, acute.*

* *Low and spreading, or tufted alpine species, flaccid or rigid.*

+– *Root annual: branches of the short panicle single or in pairs.*

3. **P. annua,** L. Stems (3 to 6 inches high) flattened, geniculate below, weak: leaves bright green, short, obtuse, sometimes wavy: panicle often 1-sided; spikelets very short-pedicelled, 3 to 7-flowered. — Everywhere in cultivated and waste grounds, generally introduced, but probably indigenous on our southern border in Arizona, New Mexico, W. Texas, etc.

+– +– *Stems geniculate-ascending from a running rootstock, rigid, very much flattened: panicle simple and contracted.*

4. **P. compressa,** L. Pale, as if glaucous: leaves short: panicle dense and narrow, somewhat 1-sided, the short branches mostly in pairs; spikelets almost sessile, 3 to 10-flowered, flat. — Indigenous within our range at the northeast, and common eastward in sterile soil. Known as "Wire Grass."

+– +– +– *Low mountain or alpine species, erect in perennial tufts.*

++ *Leaves broadly linear, short and flat, short-pointed; ligule elongated.*

5. **P. alpina,** L. Soft and flaccid, smooth or nearly so, even to the branches of the panicle: stems rather stout, 6 to 18 inches high: stem-leaves 1½ to 2 inches long, 1½ to 3 lines wide: panicle short and broad; spikelets broadly ovate, 3 to 9-flowered. — Frequent in the mountains and extending northward and eastward. Extremely variable, some of the numerous forms being described as varieties.

++ ++ *Leaves narrowly linear or setaceous.*

6. **P. laxa,** Hænke. Soft and smooth as in the last: stems slender, 3 to 10 inches high: leaves narrowly linear; *ligule elongated:* panicle somewhat raceme-like, narrow, often 1-sided and nodding; spikelets 2 to 4-flowered. — In the Rocky Mountains and eastward in the mountains of New York and New England.

7. **P. cæsia,** Smith. More strict and rigid, roughish, especially the panicle: stems 6 to 20 inches high: leaves short, soon involute; *ligule short:* branches of the panicle 2 to 5 together, very scabrous; spikelets 2 to 5-flowered: outer glumes ovate-lanceolate and taper-pointed. — In the Rocky Mountains and eastward.

Var. **strictior,** Gray, is 6 to 12 inches high, with a contracted grayish-purple panicle of smaller flowers. — Same range as the type.

* * *Tall perennials* (1 *to* 3 *feet*), *with open oblong or pyramidal panicles, the rather short and rough branches mostly in fives, sometimes in twos or threes.*

8. **P. pratensis,** L. *Stems with running rootstocks,* and with the sheaths smooth: leaves dark green, the radical very long, those of the stem short, scabrous on the margins; *ligule short and blunt:* panicle pyramidal; *spikelets* 3 to 5-flowered, *somewhat crowded and almost sessile:* outer glumes acuminate, scabrous on the keel: *flowering glume distinctly 5-nerved, silky-hairy on the margins and keel.* — Across the continent, and one of the most valuable of pasture and meadow grasses. Known variously as "June Grass," "Green Meadow-Grass," "Spear Grass," and "Kentucky Blue-Grass."

9. **P. serotina,** Ehrh. *Stems tufted,* without distinct running rootstocks: leaves narrowly linear, soft and smooth; *ligule elongated, acute:* panicle 6 to 10 inches long, at length somewhat nodding at apex, often purplish; *spikelets* 2 to 4-flowered, *all short-pedicelled:* outer glumes narrow: *flowering glume very obscurely nerved.* — From the Rocky Mountains eastward across the continent. Quite variable, some Rocky Mountain forms having been described as varieties. Known as "False Red-top" and "Fowl Meadow-Grass."

10. **P. flexuosa,** Muhl., var. **occidentalis,** Vasey. Stems erect, rather stout, tufted: sheaths mostly smooth; leaves broadly linear, 3 to 5 inches long, gradually tapering to a point, rather scabrous: *panicle more diffuse,* 4 to 8 inches long; its branches *mostly in twos or threes* (sometimes fives), *long and capillary,* smooth or scabrous, diverging, *flower-bearing mostly for the upper third:* spikelets 4 to 6-flowered: outer glumes acute, thin, slightly hispid on the keel: *flowering glume distinctly* 3 *to* 5-*nerved, slightly pubescent, rather more so on the keel and margins.* — Bot. Wheeler Exped. 290. Includes *P. flexuosa* (?) of Bot. King Exped. Colorado and Utah.

* * * *Perennials not so tall* (1 *to* 2 *feet*): *branches of the panicle solitary or in pairs.*

11. **P. Eatoni,** Watson. Allied to the last: stems smooth: *sheaths and leaves scabrous; leaves mostly radical* and narrowly linear, 3 *to* 6 *inches long,* the cauline few and very short: panicle loose and spreading, *with short* (*an inch long or less*) *branches; spikelets* 4 *to* 6-*flowered,* purplish: outer glumes acutish: *flowering glume very villous on back and margins, obtuse and keeled.* — Bot. King Exped. 386. In the Wahsatch Mountains, Utah, Nevada, and S. W. Wyoming.

12. **P. arctica,** R. Br. Stems erect, slender, very smooth, *as are the sheaths and leaves:* leaves about two on the stem, narrowly linear, 2 *to* 3 *inches long:* panicle 4 to 5 inches long, *with longer* (*lower* 2 *to* 3 *inches*) *capillary branches,* which are spreading or reflexed with age: *spikelets mostly* 3-*flowered:* outer glumes broadly ovate, rather acute, purple-margined: flowering glume obscurely 3 to 5-nerved, *acute, smooth, except pubescent on the keel and lateral nerves.* — In the mountains of Colorado and far northward.

42. GRAPHEPHORUM, Desv.

Perennial and northern or alpine grasses, with linear flat leaves, their sheaths closed at the base, and spikelets in a loose panicle.

1. **G. flexuosum,** Thurber. Stem 3 feet high, smooth: *leaves* 1½ *feet long, setaceous-acuminate:* panicle loosely flowered; branches scattered; *spike-*

lets ovate, 3 to 6-flowered, much shorter than the pedicels: outer glumes 1-nerved, *acute, half shorter than the spikelet: flowering glume keeled, 3-nerved (lateral nerves prominent), scabrous-pubescent, erose-denticulate at apex, mucronate,* villous at base. — Proc. Acad. Phila. 1863, 78. Plains of Colorado and adjacent regions.

2. **G. melicoides,** Beauv. Stem not so tall, 1 to 2 feet high, smooth above: leaves somewhat scabrous, *the lower 4 to 6 inches long, the upper short:* panicle loosely flowered, open; *spikelets lanceolate, 2 to 4-flowered, with the rhachis unilaterally bearded between the flowers:* outer glumes quite unequal, *acuminate, equalling the spikelet:* flowering glume convex, *scarcely keeled, faintly nerved, entire, pointless and awnless.* — From N. E. Utah and Wyoming northward; found also at isolated stations, as in Michigan and Maine.

3. **G. Wolfii,** Vasey. Closely resembling the last; but the *panicle close, almost spicate;* the spikelets 2-flowered with a rudiment of a third: outer glumes not so unequal: *flowering glume obscurely 5-nerved, slightly split or 2-toothed at apex, bearing near the point a straight appressed awn* equalling or a little exceeding the glume. — Bot. Wheeler Exped. 294, as *Trisetum Wolfii.* Colorado.

43. GLYCERIA, R. Br. Manna Grass.

Perennial, smooth marsh-grasses, mostly with creeping bases or rootstocks.

* *Flowering glume faintly 5-nerved, truncate, erose-toothed or subacute: stigmas with simple hairs.*

1. **G. distans,** Wahl. Stems tufted, ½ to 2 feet high: leaves short and narrow, mostly convolute and glaucous: panicle very variable, erect, narrow and one-sided, its rays in fives or fewer; spikelets 3 to 12-flowered: outer glumes from narrow and acute to broad and obtuse, 3-nerved or the lower 1-nerved: flowering glume oblong-linear, minutely pubescent at base, with broadly scarious apex. — *Atropis distans,* Griseb. Includes *G. airoides,* Thurb. *Poa airoides,* Nutt. From New Mexico to Nebraska and westward to the coast; also on the Atlantic coast. This species is very variable, and has been referred to so many genera that its synonymy is quite perplexing.

* * *Flowering glume prominently 5 to 7-nerved, truncate-obtuse: stigmas with much branched hairs.*

2. **G. nervata,** Trin. Stems 2 to 4 feet high: leaves variable, sometimes 12 to 15 inches long, usually roughish above, as are *the closed sheaths: panicle 4 to 8 inches long, its flexuose capillary branches in twos or threes, and soon diffusely spreading and pendulous;* spikelets 1 or 2 lines long, 5 to 7-flowered, sometimes purplish: *flowering glume 7-nerved,* fine scabrous, *strongly convex near the apex.* — In moist meadows and along water-courses, across the continent.

3. **G. aquatica,** Smith. *Stems stout,* erect, 3 to 5 feet high: leaves large, 1 to 2 feet long: *panicle ample, 8 to 15 inches long, much branched, the numerous branches ascending,* spreading with age: spikelets 2 or 3 lines long, 5 to 9-flowered, usually purplish: *flowering glume 7-nerved, entire.* — In wet grounds, from Colorado to California and Oregon, thence eastward across the continent. Called "Reed Meadow-Grass."

4. **G. pauciflora,** Presl. Stems 1 to 3½ feet high from a creeping root: *leaves 3 to 12 inches long,* scabrous on the margins; *sheaths split: panicle 6 to 8 inches long, loose,* its capillary branches in threes below, in pairs above, flower-bearing from near the middle; spikelets 2 to 2½ lines long, 4 to 6-flowered: *flowering glume 5-nerved,* scabrous, *its scarious tip serrulate or toothed,* more or less purplish. — From Colorado and Utah northward and westward.

44. FESTUCA, L. Fescue Grass.

Includes both slender-stemmed annuals and perennials, the flowers, and often the leaves, being rather dry and harsh.

* *Annuals or biennials with setaceous leaves: panicle contracted or spike-like.*

1. **F. tenella,** Willd. Stems often filiform, 6 to 18 inches high: the erect leaves 1 to 3 inches long; sheaths sometimes pubescent: panicle 2 to 3 inches long, simple, *often secund;* spikelets, including awns, 4 or 5 lines long, 7 *to* 13*-flowered:* outer glumes subulate, very acute, the lower at least half the length of the upper: flowering glume involute, rough, 2 lines long exclusive of its awn, *which is mostly shorter than the palet and often very short.* — Across the continent.

2. **F. microstachys,** Nutt. Stems 4 to 15 inches high, the filiform leaves, sheaths, etc. smooth to *strongly pubescent:* panicle 1 to 5 inches long, simple and *racemose or spike-like; spikelets 1 to 5-flowered, on short thickened pedicels,* from scabrous to smooth: outer glumes acute, the upper little exceeding or twice as long as the lower: flowering glume 2 or 3 lines long, *with an awn 3 to 5 lines in length:* palet with 2 long setose teeth. — From N. E. Utah to Nevada and westward all along the coast.

* * *Perennials: the mostly short-awned spikelets in loose, or more or less open panicles.*

3. **F. ovina,** L. *Stems 6 inches to 2 feet high, glaucous:* leaves all setaceous or the upper flat; *ligule 2-lobed and auriculate:* panicle short, more or less compound, somewhat one-sided, *the branches mostly solitary;* spikelets 3 to 8-flowered: flowering glume about 3 lines long, *ternate, mucronate or with an awn less than half its own length.* — Mountains of Colorado and California and northward, thence eastward across the continent.

Var. **duriuscula,** Gray. Taller, less densely tufted: stem-leaves often flat and sheaths pubescent: panicle more open and spikelets larger. — Same range as the type.

Var. **rubra,** Gray. Less tufted, with running rootstocks: leaves sometimes flat, and with the spikelets often reddish or purplish. — High alpine form in the Colorado Mountains and far northward.

Var. **brevifolia,** Watson. Stems 4 to 8 inches high: leaves all setaceous and sheaths glabrous; uppermost leaves often very short and the sheaths rather loose: panicle racemose and nearly simple, 1 to 2 inches long; spikelets 1 to 4-flowered, the florets terete and twice the length of the awn. — Bot. King Exped. 389. Same range as the last.

4. **F. scabrella,** Torr. *Stems 1 to 3 or 4 feet high, crowded below with leafless sheaths,* and twice longer than the *numerous scabrous radical leaves:* stem-leaves rarely more than 2, long-pointed; *sheaths scabrous or rough-pubes-*

cent; ligule a ciliate fringe: panicle 3 to 6 inches long, the lower rays distant *in pairs;* spikelet 4 to 6-flowered: flowering glume 5-nerved, *rough, with a narrow scarious margin, pointed, or with an awn a line long or less.* — *F. Thurberi,* Vasey. *Melica Hallii,* Vasey, is an alpine form. In the Rocky Mountains and westward. One of the most valuable of the numerous "Bunch Grasses."

45. BROMUS, L. Brome Grass.

Coarse grasses, with large spikelets at length drooping, on pedicels thickened at the apex. Our indigenous species are perennials.

* *Flowering glume convex or keeled on the back: flowers imbricated over one another before expansion: lower glume* 3 *to* 5*-nerved, the upper* 3 *to* 9*-nerved.*[1]

1. **B. Kalmii,** Gray, var. **Porteri.** *Stem* 12 *to* 18 *inches high,* smooth: *sheaths and leaves minutely scabrous:* panicle 6 inches long, *compound,* branches minutely downy; spikelets an inch long, *canescent with short appressed silky hairs,* 7 to 9-flowered: *outer glumes each* 3*-nerved, obtuse: flowering glume* 7*-nerved;* its awn 1½ lines long. — Colorado, at Twin Lakes (*Porter*), Buffalo Peaks, and Sierra Madre Range (*Coulter*).

2. **B. breviaristatus,** Thurb. *Stem* 2 *to* 3 *feet high:* leaves broadly linear, a little hairy; *sheaths hairy to villose-tomentose,* sometimes even naked: panicle elongated, 3 to 8 inches long, *nearly simple,* loose; spikelets about an inch long, lanceolate, *compressed and sharply* 2*-edged, minutely scabrous,* 6 to 8-flowered: *outer glumes acute, lower about* 5*-nerved, upper* 9*-nerved: flowering glume acutely keeled,* 9*-nerved,* with an awn 1 to 2 lines long. — *Ceratochloa breviaristata,* Hook. From Colorado northward to Montana and Washington Territory.

* * *Flowering glume somewhat convex, but keeled on the back: flowers soon separating from each other: lower glume* 1*-nerved, the upper* 3*-nerved, or with an obscure additional pair.*

3. **B. ciliatus,** L. Tall, 3 to 5 feet high, with the large leaves smooth or somewhat hairy; sheaths often hairy or densely downy near the top: panicle compound, very loose, the elongated branches at length drooping; spikelets 7 to 12-flowered: flowering glume tipped with an awn ½ to ¾ its length, 7-nerved, silky with appressed hairs near the margins, smooth or smoothish on the back. — Across the continent and far northward.

46. AGROPYRUM, Beauv.

Perennials, with nearly lanceolate glumes, and 2-ranked spikes; thus differing from *Triticum* (Wheat), although formerly included under that genus.

* *Multiplying by long jointed creeping rootstocks: awn, when present, not longer than the flowering glume.*

1. **A. repens,** Beauv. Stems 1 to 3 feet high: leaves flat or convolute and with sheaths very variable, from smooth to scabrous or pubescent: spike-

[1] The too common "Cheat" or "Chess," *B. secalinus,* L., belongs to this section. It is an annual, with spreading panicle, oblong-ovate turgid smooth spikelets of 8 to 10 rather distant flowers, flowering glume short-awned or awnless, and nearly glabrous sheaths. — Introduced wherever grain is cultivated.

lets 4 to 8-flowered, in an erect mostly rigid spike: glumes 5 to 7-nerved, obtuse or notched, with a rigid short point or awn of variable length: flowering glume similar, but nerved only above, with an awn nearly its own length or awnless. — *Triticum repens*, L. Immensely variable; its many perplexing forms yielding numerous but confusing varieties. Across the continent, and known by a great variety of names, such as "Couch," "Quack," and "Quitch Grass," "Blue-joint," "Bunch Grass," "Lagoon Grass," etc.

* * *No running rootstock: flowering glume and sometimes the outer glumes long-awned.*

2. **A. caninum,** Reich. Stems 1 to 3 feet high, geniculate below: *leaves flat or loosely convolute, pubescent above and like the sheaths smooth below: spike more or less nodding,* at least not strict; spikelets 3 to 6-flowered: outer glumes 5 to 7-nerved, *with long awns or merely acuminate:* flowering glume 5-nerved near the tip, *with mostly spreading awns twice as long.* — *Triticum caninum*, L. *T. ægilopoides*, Gray, not Turcz. From California to Colorado and Nevada, eastward to New England. Extremely variable.

3. **A. Scribneri,** Vasey. *Stems densely tufted,* geniculate and *usually prostrate, 1 to 1½ feet high: leaves very short* (1 to 1½ inches long), *smooth, rigid, sometimes glaucous:* outer glumes 3 to 5-nerved, extended into a long hispid point: flowering glume with a strong, spreading or recurved hispid awn at least twice as long: otherwise as in the last. — Torr. Bull. x. 128. Possibly only a variety of the last. In the Sierras (*Pringle*), and Montana (*Scribner*). High on the mountains, in crevices and among loose rocks.

4. **A. violaceum,** Beauv. Stems slender, 1 to 2 feet high, and *with the short mostly convolutely-setaceous leaves and sheaths usually smooth:* spike 1 to 3 inches long, slender, *strict and rigid;* spikelets 3 to 5-flowered, usually purple-tinged: outer glumes with 5 strong rough nerves, *short-pointed or short-awned:* flowering glume strongly 5-nerved and rough above, *with an awn from half to fully as long.* — *Triticum violaceum*, Hornem. Rocky Mountains and Sierra Nevada; also mountains of New York and New England.

5. **A. strigosum,** Beauv. Stems slender, 1 to 2 feet high, very densely tufted, *with setaceous radical leaves half as tall, glaucous throughout;* stem-leaves 3, all narrowly setaceously-convolute, *strigose-pubescent on the upper surface, below and with the sheaths smooth or pubescent:* spike 2 to 6 inches long, *very slender;* spikelets 3 to 6-flowered: outer glumes strongly 3 to 5-nerved, *somewhat acute:* flowering glume 5-nerved near the apex and bearing *a longer strong rough divergent awn.* — *Triticum strigosum*, Less. *T. ægilopoides*, Turcz. In the mountains of Colorado, Montana, and westward.

47. HORDEUM, L. Barley.

Rather low grasses, with flowers in spikes and more or less prominent bristle-form glumes.

1. **H. nodosum,** L. Stems ½ to 3 feet high, often geniculate below: leaves flat or convolute, varying from nearly smooth to hairy: spike 1 to 3 inches long, narrow and readily separating into joints; the lateral neutral spikelets *merely awn-pointed: glumes all setaceous: perfect floret* 8 *lines long including the awn.* — *H. pratense*, Huds. *H. pusillum*, Nutt. From California

and Oregon eastward into the Mississippi Valley; introduced on the Atlantic coast.

2. **H. jubatum,** L. Stems 1 to 2 feet high, usually smooth throughout, the margins of the leaves sometimes scabrous: spike very pale green or straw-color, shining, sometimes purplish, 2 to 4 inches long, broader, the very slender rhachis readily separating; *lateral floret short-awned: glumes very long and capillary: perfect floret* 3 *lines long, with an awn* 2 *inches long,* longer than the glumes and spreading. — Common westward and northward, extending eastward through the Northern States. Known as "Squirrel-tail Grass."

48. ELYMUS, L. Lyme Grass. Wild Rye.

* *Outer glumes subulate-setaceous, shorter than the spikelet: flowering glume merely cuspidate.*

1. **E. condensatus,** Presl. Stems 2 to 6 feet high or more, with ample mostly flat leaves, smooth except on the margins: spike 5 to 15 inches long, dense or interrupted, simple or frequently made up of fascicled short few-flowered branches; spikelets 3 to 6-flowered: flowering glume 5-nerved above, mucronate-pointed or somewhat 3-toothed. — From Colorado and Nevada to California and Oregon.

* * *Outer glumes acuminate-pointed or awned: flowering glume with an awn longer than itself.*

2. **E. Sibiricus,** L. Stems 2 to 3 feet high: leaves mostly ample, often 6 lines broad, glabrous or partly scabrous: *spike virgate,* 2 to 8 inches long, often somewhat nodding above; spikelets in pairs, 3 to several-flowered: *glumes linear-lanceolate,* 3 to 5-nerved, *pointed or short-awned:* flowering glume 5-nerved and *rough above,* with an awn about 1½ times its own length. — From California and Oregon to Lake Superior.

3. **E. Canadensis,** L. Like the last, but stouter and taller: leaves rougher, sometimes glaucous: spikes stouter, *somewhat loose and more nodding* above: *outer glumes subulate,* 3 or perhaps 4-nerved, *tapering into an awn shorter than itself: flowering glume rough-hairy,* with a longer usually spreading awn. — Across the continent.

* * * *Outer glumes very long, usually* 2*-parted to the base, the divisions unequally* 2*-cleft and long-awned: flowering glumes long-awned and* 2*-toothed, or* 3*-awned.*

4. **E. Sitanion,** Schult. Stems densely tufted, ½ to 2 feet high: leaves and sheaths from smooth and glaucous to roughly hirsute; leaves setaceously pungent at apex, the upper one an inch or two long, its sheath often loose and including the base of the spike: spike 1 to 6 inches long; spikelets 1 to 5-flowered: awns of the outer glumes 1 to 3 inches long: flowering glume 3 lines long, its central awn equalling those of the glumes. — From Minnesota to Texas and westward across the continent. Exceedingly variable, so much so that the collector is apt to discover at least a "new variety" in almost every locality.

Class II. GYMNOSPERMÆ.

Ovules naked upon the surface of a scale or bract, or within a more or less open perianth. Flowers monœcious or diœcious. Cotyledons two or often several in a whorl.

Order 89. GNETACEÆ.

Shrubs or small trees, mostly with jointed opposite or fascicled branches and foliaceous or scale-like opposite (or ternate) exstipulate leaves, the flowers mostly diœcious, with decussate persistent bracts; the staminate in aments, with solitary or monadelphous stamens within a membranous bifid calyx-like perianth, the anther-cells dehiscent by a pore or chink at the apex; fertile flowers of an erect sessile ovule terminated by an exserted style-like process, included within a perianth which becomes hardened and often thickened in fruit.

1. EPHEDRA, Tourn.

Inflorescence axillary: the 3 to 8 filaments united into a clavate stamineal column. — Shrubs with numerous Equisetum-like branches, the leaves reduced to sheathing scales, persistent or deciduous.

1. **E. Nevadensis,** Watson. Erect, 2 feet high or more; *branches opposite:* scales sheathing, 2-lobed, with short blunt lobes or more or less elongated tips: *bracts opposite and evidently connate:* staminate aments sessile or shortly pedunculate, ovate, of 4 to 6 pairs of bracts: fertile aments pedunculate. — Proc. Am. Acad. xiv. 298. *E. antisyphilitica* of Bot. King Exped. and other reports. From California and Nevada to Utah and the Rio Grande.

2. **E. trifurca,** Torr. Erect, *with spinosely tipped ternate branches and conspicuous persistent sheathing acuminate scales becoming white and shreddy: bracts in threes:* staminate perianth cuneate-oblong, included: fertile aments of numerous whorls of entire bracts. — S. W. Colorado (*Brandegee*), New Mexico, and Arizona.

Order 90. CONIFERÆ. (Pine Family.)

Resinous and mostly evergreen trees or shrubs, with awl- or needle-shaped or scale-like mostly rigid leaves, and monœcious or rarely diœcious flowers; male flowers reduced to stamens only, which are indefinite in number upon a central axis; fertile aments of few or many scales, becoming in fruit a dry cone or berry-like; ovules two or more, at or on the base of each scale.

* Scales of the fertile aments few, decussately opposite, becoming drupe-like in fruit with bony seeds: leaves opposite or in threes, usually scale-like: flowers dicœcious: leaf-buds not scaly.

1. **Juniperus.** Ovules in pairs or solitary at the base of the fleshy (4 to 6, or 3 to 9) scales. Seeds 1 to 5 or more. Berry globose, reddish, blue, or blackish, ripening the second year.

* * Scales of the fertile aments numerous, spirally imbricated, becoming a dry coriaceous cone in fruit: male flowers also spirally arranged: leaves scattered or fascicled, from linear to needle-shaped: flowers monœcious: leaf-buds scaly. — ABIETINEÆ.

+– Cones maturing the first year, their bracts remaining membranous: leaves solitary, mostly entire.

++ Branchlets smooth, the leaf-scars not raised.

2. **Abies.** Leaves sessile, leaving circular scars. Cones erect, their scales deciduous from the axis. Seeds with resin-vesicles.

3. **Pseudotsuga.** Leaves petioled, the scars transversely oval. Cones pendulous, their scales persistent on the axis. Seeds without resin-vesicles.

++ ++ Branchlets rough from the prominent persistent leaf-bases: cones pendulous, their scales persistent on the axis.

4. **Picea.** Leaves sessile, keeled on both sides, with two lateral ducts. Seeds without resin-vesicles.

+– +– Cones maturing the second year, their bracts becoming corky and thickened: leaves in bundles of 2 to 5, their base surrounded by a sheath of scarious bud-scales usually serrulate.

5. **Pinus.** Resin-ducts inconstant in number and variously placed.

1. JUNIPERUS, L. JUNIPER.

The small solitary aments axillary, or terminal upon short lateral branchlets: in staminate flowers the anther-cells are 4 to 8 under each shield-shaped scale: cotyledons mostly 2. — Low shrubs or trees, with mostly thin shreddy bark.

* *Aments axillary: leaves ternate, free and jointed at base, linear-subulate, pungent, channelled and white-glaucous above, not glandular-pitted.* — OXYCEDRUS.

1. **J. communis,** L. With spreading or pendulous branches: leaves rigid, more or less spreading, 5 to 9 lines long: fruit dark blue, 3 lines in diameter or more, 1 to 3-seeded.

Var. **alpina,** Gaud. Low and decumbent or prostrate: leaves shorter, 2 to 4 lines long, and less spreading. — The species is found in the mountains from New Mexico and northward throughout British America, while the variety has a range not quite so extensive.

* * *Aments terminal: leaves ternate (or opposite), of two forms, mostly adnate and scale-like, closely appressed and crowded upon the branches and often glandular-pitted, occasionally more distant, free and subulate.* — SABINA. Ours belong to the group with bluish-black pulpy berries.

+– *Leaves fringed on the edges.*

2 **J. occidentalis,** Hook. A shrub or small tree, with shreddy bark and pale reddish-yellow wood: leaves closely appressed, obtuse or acutish: berries 4 to 5 lines in diameter, with one or more seeds. — Northwest of our range.

Var. **monosperma,** Eng. Often with eccentric layers of wood, of scraggy growth, with short branchlets at right angles: leaves as often in twos as in threes: berries smaller, often copper-colored, with mostly one (sometimes 2 or more) grooved seed. — Trans. Acad. St. Louis, iii. 590. From the Pike's Peak region of Colorado to W. Texas, Arizona, and California.

+ + *Leaves entire or nearly so, and opposite.*

3. **J. Sabina,** L., var. **procumbens,** Pursh. *A prostrate shrub* with appressed or slightly squarrose acute leaves in pairs, *margin slightly or indistinctly denticulate: berries on short recurved peduncles,* 3 to 4 lines in diameter, with 1 or 2, rarely 3 rough seeds. — From British Columbia and the Pacific Coast to the Yellowstone River, the Great Lakes, and eastward to Maine and Hudson's Bay.

4. **J. Virginiana,** L. *The largest of our Junipers, sometimes becoming a tree* 60 *to* 90 *feet high,* commonly of pyramidal form, sometimes with rounded spreading top, with shreddy bark and red and aromatic heartwood: branchlets slender, 4-angled, with obtuse or acutish leaves *having entire margins: berries on straight peduncles,* 3 to 5 lines in diameter, with 1 or 2 angled mostly grooved seeds. — Our widest spread species, with almost a continental distribution, the region from Arizona to Utah, California, and Oregon alone being excepted.

2. ABIES, Link. Fir.

Trees of pyramidal form and rapid growth, but with brittle and easily decaying wood: leaves on the horizontal branchlets appearing 2-ranked by a twist near the base, in ours bearing stomata on both sides, with two longitudinal resin-ducts.

1. **A. concolor,** Lindl. A large tree 80 to 150 feet high with a diameter of 2 to 4 feet and a *rough grayish bark:* leaves mostly obtuse, *pale green, with the two resin-ducts close to the epidermis of the lower surface:* cones oblong-cylindrical, 3 to 5 inches long and 1 to 1¾ inches in diameter, pale green or sometimes dull purplish; *scales* 12 *to* 15 *lines wide, nearly twice wider than high.* — Has been mostly called *A. grandis,* which is much taller and has a more northwestern range. *A. amabilis* (?) Watson, Bot. King Exped. *Pinus concolor,* Eng. From Arizona and S. Colorado to Utah and California. Known as "White Fir" on account of its gray bark.

2. **A. subalpina,** Eng. Not so tall, 60 to 80 feet high, with *very pale and thin, smooth,* or only in very old trees cracked, and ashy-gray *bark: leaves dark green above,* sharp-pointed, *with the two resin-ducts about equidistant from upper and lower surface:* cones oblong-cylindrical, 2½ to 3 inches long and 1 to 1¼ inches in diameter, purplish brown; *scales nearly orbicular or sometimes quadrangular,* 6 *to* 10 *lines long and broad.* — Am. Nat. x. 555. *A. grandis,* in part, of the Rocky Mountain botanists. On the higher mountains and near to timber line, from Colorado northwestward to Oregon.

3. PSEUDOTSUGA, Carr. Douglas Spruce.

A very large tree, at first pyramidal and spruce-like, often at last more spreading: leaves somewhat 2-ranked by a twist at the base, with stomata

only on the lower surface, close to the epidermis of which are the two lateral resin-ducts.

1. **P. Douglasii,** Carr. A large tree, 150 to over 300 feet high, 6 to 15 feet in diameter, with very thick brown deeply fissured bark: leaves flat, linear, 8 to 12 lines or more long: cones 2 to 4 inches long, subcylindrical; bracts more or less exsert and spreading or reflexed, giving a fringed appearance to the cones: seeds triangular, on the upper side convex and reddish brown, on the lower flat and white, 3 lines long. — *Abies Douglasii,* Lindl. Throughout the Rocky Mountains and those of California, reaching its greatest proportions in Oregon.

4. PICEA, Link. Spruce.

Tall pyramidal trees, with white soft tough timber.: leaves spirally arranged around the branchlets, or somewhat 2-ranked.

1. **P. Engelmanni,** Eng. A tall pyramidal tree, 60 to 100 feet high, with horizontal branches; *bark thin, scaly, reddish or purplish-brown; branchlets pubescent:* leaves 6 to 15 lines long: *fertile aments 9 to 10 lines long, dark purple:* cone solitary, *ovate-cylindric, about 2 lines long,* reddish brown; *scales obovate-rhombic, subtruncate or emarginate, erose.* — *Abies Engelmanni,* Parry. In the mountains from New Mexico to Montana and Oregon, forming extensive forests.

2. **P. pungens,** Eng. Of strictly conical growth, with spreading branches; *bark thick, smooth, and gray,* in older trees becoming very thick, hard and ridged; *branchlets smooth and shining:* leaves 6 to 12 lines long, *more pungent: fertile aments 15 to 20 lines long, with pale shining rounded scales:* cones abundant, solitary or clustered, *cylindrical, drooping,* 2½ *to 5 inches long,* light brown; *scales oval or subrhombic,* more or less elongated above, *undulate and retuse.* — The form in the Rocky Mountains heretofore called *Abies Menziesii,* which latter has a much more northwestward range and now bears the name *Picea Sitchensis,* Carr. Commonly called "Balsam."

5. PINUS, Tourn., Link. Pine.

Trees, usually not so large as in the preceding genera, nor often of such pyramidal habit, with wood of the greatest value: primary leaves (only on seedlings and young shoots) flat, subulate and serrulate; the secondary in bundles, needle-shaped, terete, semiterete, or triangular, depending on the number in a bundle.

§ 1. *Scales slightly if at all thickened at the end and wholly destitute of prickle or point: leaves in fives, with resin-ducts close to the epidermis, their sheaths loose and deciduous: cones subterminal.* — Strobus. In ours the leaves are entire or nearly so, and the cones subsessile.

1. **P. flexilis,** James. A tree about 60 feet high and 3 to 5 feet thick, with furrowed gray bark: leaves 1½ to 2 inches long: cones oval to subcylindric, 3 to 5 inches long, light brown, with somewhat squarrose scales. — Long's Exped. ii. 27. In the mountains from New Mexico to Montana and westward.

Var. **albicaulis,** Eng. A tree 40 or 50 feet high, becoming low and shrubby at the highest elevations, with very pale bark: cones oval or subglobose, 1½ to 3 inches long, 1½ to 2¼ inches thick, purple brown; scales much thicker and somewhat pointed. — Bot. Calif. ii 124. *P. albicaulis,* Eng. On alpine peaks in Montana, extending from the mountainous regions of California to British Columbia.

§ 2. *The woody scales thickened at the end, and usually spiny-tipped (sometimes blunt-pointed).* — PINASTER.

* *Resin-ducts close to the epidermis: leaves with entire margins and loose deciduous sheaths.*

2. **P. edulis,** Eng. *A low round-topped tree,* branched from the base or near it, 10 to 15 feet high: *leaves mostly in pairs* (rarely in threes), 1 to 1½ inches long, rigid, curved or straightish, *spreading: cones sessile, subglobose,* 2 inches long; tips of scales thick, truncate, raised-pyramidal *but without awns or prickles: seeds brown, wingless,* edible. — From S. Colorado and southward. The "Piñon" or "Nut Pine" of the Indians. Westward it is replaced by *P. monophylla,* Torr. & Frem.

3. **P. Balfouriana,** Jeffrey. A medium-sized tree, seldom over 50 feet high and sometimes 5 feet in diameter, *of regular pyramidal growth:* bark red-brown, deeply fissured: *leaves in fives,* 1 to 1¼ inches long, rigid, curved, crowded and *appressed to the stem: cones pendulous from the slender branchlets, subcylindrical,* 3½ to 5 inches long, dark purple; tips of scales thick, *with short deciduous prickles: seeds pale, mottled, and winged.* — West of our range.

Var. **aristata,** Eng. Tree 50 to 100 feet high: cones ovate, with thinner scales, and with shorter *recurved or slender awn-like prickles:* seeds smaller and wings shorter. — Bot. Calif. ii. 125. *P. aristata,* Eng. From Colorado through Nevada and Arizona to California.

* * *Resin-ducts within the cellular tissue: leaves serrulate and with persistent sheaths: cones subterminal.*

4. **P. ponderosa,** Dougl. One of the largest pines (200 to 300 feet high and 12 to 15 feet thick), *with very thick red-brown bark, deeply furrowed and split in large plates: leaves in threes,* 5 *to* 11 *inches long:* cones oval, 3 to 5 inches long, 1½ to 2 inches thick, of a *rich brown color,* sessile or nearly so, often 3 to 5 together; *tip of scales with a stout straight or incurved prickle: seeds dark brown,* 4 *lines long; wings* 10 *to* 12 *lines long, widest above the middle.* — The most magnificent and widely spread Western pine. Known as the "Yellow Pine." The following form is found throughout the Rocky Mountains.

Var. **scopulorum,** Eng. A smaller tree (80 to 100 feet high): *leaves* 3 *to* 6 *inches long,* often in pairs: cones smaller, 2 or 3 inches long, *grayish brown, with stout prickles: seeds* 2½ *to* 3½ *lines long.* — Bot. Calif. ii. 126. Most of the *P. ponderosa* of the Rocky Mountains is of this variety.

5. **P. contorta,** Dougl. A low tree, 5 to 15 or rarely 25 feet high and 6 inches in diameter, with a rounded or depressed top and *thin smoothish bark: leaves in pairs,* 1 *to* 1½ *inches long:* cones clustered, oval or subcylindric, *very oblique; tip of scales with strong knobs and delicate prickles: seeds black,* grooved, 2 *lines long; wings* 6 *lines long, widest above the base and tapering upward.* — A Pacific Coast species from California to Alaska.

Var. **Murrayana,** Eng. Much taller and straighter, 80 to 120 feet high and 4 to 6 feet in diameter, with a conical head and *thin scaly light grayish-brown bark: leaves* 1 *to* 3 *inches long,* $\frac{3}{4}$ *to* 1 *line wide,* light green: cones very rarely lateral, less oblique: wings of seeds longer. — Bot. Calif. ii. 126. *P. Murrayana,* Murr. *P. contorta,* var. *latifolia,* Eng. In the mountains of Colorado and Utah, and extending northward and westward.

SERIES II.

PTERIDOPHYTA (Vascular Cryptogams), or Ferns and their allies.

Plants destitute of proper flowers, that is, having no stamens and pistils, and not producing seeds. A distinct axis containing fibro-vascular bundles, as does the foliage when there is any. Sexual reproduction by means of antheridia and archegonia, one or both of which is formed on a prothallus which is developed from the non sexual spore and upon which the conspicuous but non-sexual plant is produced.

Class I. LYCOPODINEÆ.

Plants with a solid, dichotomously branched, leafy stem, the leaves imbricated and often giving to the lower forms a moss-like appearance, but may be distinguished from moss leaves by their midrib. Sporangia in the axils of simple leaves or bracts.

Subclass I. HETEROSPOREÆ.

Producing spores of two kinds, the larger (*macrospores*) producing a prothallus with archegonia, the smaller (*microspores*) producing a prothallus (rudimentary) with sperm-cells. Leaves with ligules.

Order 91. **ISOËTÆ.** (Quillwort Family.)

Mostly aquatic plants, with a short solid corm-like stem (*trunk*) and elongated grass-like leaves, the bases of which are expanded and have thin stipule-like infolded margins (the *velum*), which enclose large simple ovoid thin-walled sporangia; the outer ones containing large spherical trivittate macrospores; those of the inner leaves filled with very minute grayish triangular microspores.

1. ISOËTES, L. Quillwort.

Characters those of the order. For an elaboration of the genus see Engelmann in Trans. St. Louis Acad. iv. 358. Our species (as reported at present) belong to the group with bilobed trunks, are all submerged, with quadrangular leaves and an incomplete velum.

1. **I. lacustris,** L. Leaves stout, *rather rigid, acute but scarcely tapering,* dark or olive-green, 10 to 25 in number, 2 to 6 inches long, *with no stomata:* sporangium orbicular to broadly elliptical, *not spotted, with a rather narrow velum;* macrospores 0.50 *to* 0.80 *mm.*[1] *in diameter, marked all over with distinct or somewhat confluent crests; microspores smooth,* 0.035 *to* 0.046 *mm. in the longer diameter.* — Generally distributed throughout Northern America and New England.

Var. **paupercula,** Eng. Leaves fewer (10 to 18), *thinner, shorter* (2 to 3 inches): *spores smaller;* macrospores 0.50 to 0.66 mm. in diameter; microspores *somewhat granulated,* 0 026 to 0.036 mm. long. — Trans. St. Louis Acad. iv. 377. Grand Lake, Middle Park, Colorado (*Engelmann*), and near Mt. Shasta, California (*Pringle*).

2. **I. echinospora,** Durieu, var. **Braunii,** Engelm. *Leaves soft and tapering,* green or reddish green, erect or spreading, 13 to 15 in number, 3 to 6 inches long, *generally with a few stomata towards the tip:* sporangium as in the last, but *spotted* and generally ½ or even ¾ covered by a *broad velum; macrospores* 0.40 *to* 0.50 *mm. thick, covered with broad retuse spinules,* sometimes somewhat confluent and then dentate or incised at tip; *microspores* 0.026 *to* 0.030 *mm. long, smooth.* — Gray, Manual, 676. Lake at the head of Bear River, Uinta Mountains (*Watson*). The most common species eastward, but reported only from the one station within our range. Apparently replaced with us by the following.

3. **I. Bolanderi,** Engelm. Leaves erect, *soft, bright green, tapering to a fine point,* 5 to 25 in number, 2 to 4½ inches long, generally not many stomata: sporangium broadly oblong, *mostly without spots, with a narrow velum;* macrospores 0.30 *to* 0.40 *mm. thick, marked with minute low tubercles or warts;* microspores 0.026 to 0.031 mm. long, *generally spinulose,* rarely smooth. — Am. Nat. viii. 214. In ponds and shallow lakes in the Rocky Mountains, Sierra Nevada of California, and Cascades.

Order 92. SELAGINELLÆ.

Moss-like plants with slender branching stems and small leaves arranged in 4 or several ranks: sporangia minute, subglobose; some containing usually 4 globose macrospores; others (smaller and more abundant) filled with numerous microspores.

1. SELAGINELLA, Beauvois.

Characters those of the order. In ours the leaves are all alike arranged in many ranks, those of the fruiting spikes 4-ranked.

[1] The millimeter is very nearly half a line.

1. **S. rupestris,** Spring. Stems prostrate or ascending, rather rigid, 2 to 12 inches long, vaguely or subpinnately branching: leaves glaucescent, closely imbricated and appressed, lanceolate, scarcely a line long, convex and grooved on the back, bristle-tipped and ciliate: spikes strongly quadrangular: macrosporangia abundant, intermixed with the slightly smaller and more numerous microsporangia. — On dry rocks, especially in the mountains.

Subclass II. ISOSPOREÆ.

Producing but one kind of spore. Leaves without ligules.

Order 93. **LYCOPODIACEÆ.** (Club-Moss Family.)

Moss-like plants, with small leaves imbricated in 4 to many rows on the pinnately or dichotomously branching stems, and (in ours) with reniform 1-celled sporangia in the axils of bracts forming stalked or sessile spikes.

1. **LYCOPODIUM,** L., Spring. Club-Moss. Ground-Pine.

Characters those of the order. In ours the leaves (bracts) of the spike are yellowish, ovate or heart-shaped, very different from the other leaves.

1. **L. annotinum,** L. Stems prostrate and creeping, 1 to 4 feet long; the ascending branches similar, dichotomous, 4 to 6 inches high: leaves in several ranks, equal, spreading, rigid, lanceolate, pointed, serrulate, 2 to 4 lines long: spikes solitary at the ends of leafy branches. — From Colorado to Washington Territory, eastward and northward across the continent.

Class II. FILICINÆ.

Plants with a solid stem, which (in ours) is horizontal and usually underground, bearing broadly expanded mostly long-petioled leaves (*fronds*), with prominent midrib and veins. Prothallus monœcious.

Order 94. **RHIZOCARPEÆ.** (Pepperwort Family.)

Aquatic plants, with a horizontal stem floating upon the water or running through the mud at the bottom of shallow water: leaves circinately developed, simple or quadrifid: spores of two kinds: the fruits (*conceptacles*) borne on peduncles (in fact petioles), or sessile beneath the stem.

1. **Marsilia.** Conceptacles somewhat crustaceous, several-celled, containing both macrospores and microspores, solitary and peduncled. Leaves peltately quadrifoliolate, with elongated petioles.
2. **Azolla.** Conceptacles very soft and thin-walled, one-celled, containing either macrosporangia with solitary macrospores or microsporangia with numerous microspores, in pairs beneath the pinnately branched stems. Leaves minute, imbricated, and 2-lobed, apparently distichous.

1. MARSILIA, L.

Conceptacles ovoid or bean-shaped, composed of 2 vertical valves and several transverse compartments in each valve; their peduncles rising either from the petiole or the rhizome. — Plants with slender creeping rootstocks, growing in the mud under shallow water, with the leaves floating, or sometimes terrestrial.

1. **M. vestita,** Hook. & Grev. Leaflets broadly cuneate, usually hairy, entire, 2 to 7 lines long and broad; petioles 1 to 4 inches long: peduncles free from the petiole: sporocarps short-peduncled, about 2 lines long, very hairy when young. — From Texas to Oregon and California. In Yellowstone Park (*Coulter*).

2. AZOLLA, Lam.

Small moss-like floating plants, the pinnately branched stems covered with minute imbricated leaves and emitting rootlets on the under side: the paired conceptacles either both containing macrospores, or one of each kind; smaller conceptacles acorn-shaped, containing a single macrospore; larger conceptacles globose, and having a basal placenta which produces many pedicelled sporangia containing masses of microspores.

1. **A. Caroliniana,** Willd. Plant 4 to 12 lines broad, much branched: leaves with ovate lobes, inferior lobe reddish, superior one green with a reddish border: macrospores with a minutely granulate surface: masses of microspores glochidiate. — Floating on quiet waters, from Oregon to Arizona and eastward to the Atlantic.

Order 95. OPHIOGLOSSACEÆ. (Adder's-Tongue Family.)

Leafy plants; the leaves (*fronds*) simple or branched, erect in vernation: spores of one kind, borne in special spikes or panicles in sporangia (without an elastic ring), which are formed by groups of cells in the interior of the fruiting segments of the frond: prothallus underground, destitute of chlorophyll.

1. BOTRYCHIUM, Swartz. Grape-Fern. Moonwort.

Fronds with a posterior pinnatifid or compound sterile segment and an anterior panicled fertile segment, the separate sporangia in a double row on the branches of the panicle: bud enclosed in the base of the stalk.

* *Base of the stalk which encloses the bud closed on all sides: sterile division more or less fleshy, the cells of the epidermis straight.*

+ *Sterile division usually placed at or above the middle of the plant: frond never hairy.*

1. **B. Lunaria,** L. Plant 4 to 10 inches high, *very fleshy:* sterile division sessile *near the middle of the plant, oblong or ovate,* once pinnatifid; pinnæ or lobes *semilunar from a broadly cuneate base,* the sides concave, the outer margin crenate or even incised. — From Colorado (*Parry*) and New England northward.

2. **B. lanceolatum,** Angstr. Plant 2 to 10 inches high, *scarcely fleshy: sterile division high up on the plant,* sessile, *deltoid,* once or twice pinnatifid with *oblique oblong-lanceolate acute segments.* — From Colorado (*Brandegee*) to New England and in the far North.

+ + *Sterile division placed low down on the plant.*

3. **B. simplex,** Hitchcock. *Plant smooth,* fleshy, 2 to 6 inches high: *sterile division short-petioled, varying from simple and roundish-obovate* and 2 to 3 lines long, *to triangular-ovate and deeply 3 to 7-lobed,* or *even to fully ternate* with incised divisions; *segments broadly obovate-cuneate* or somewhat lunate: *fertile division 1 to 2-pinnate.* — Yellowstone Park (*Parry*) and California; eastward from Lake Superior to New England. Exceedingly variable, the true form thought to be most nearly represented by

Var. **compositum,** Milde. A low alpine form with the sterile segment an inch or less long, ternate, or composed of 3 ovate incised segments.

4. **B. ternatum,** Swartz. *Plant sparsely hairy,* fleshy, 4 to 12 inches high: *sterile division long-petioled* from near the base of the plant, *broadly deltoid, ternate and variously decompound;* ultimate segments from *roundish-reniform* and subentire to *ovate-lanceolate* and doubly incised: *fertile division 2 to 4-pinnate.* — Throughout North America. Exceedingly variable, with many described varieties and synonyms.

* * *Base of stalk which encloses the bud open along one side: sterile division membranaceous, the cells of the epidermis flexuous.*

5. **B. Virginianum,** Swartz. Plant sparsely hairy, 8 to 24 inches high: sterile divisions sessile near the middle of the plant, broadly triangular, ternate; primary pinnæ short-stalked, 1 to 3 times pinnatifid; secondary pinnæ ovate-lanceolate; ultimate segments toothed at the ends: fertile division 2 to 4-pinnate. — From Washington Territory to Colorado (*Brandegee*) and Texas, and eastward across the continent.

Order 96. **FILICES.** (True Ferns.)

Leafy plants; the leaves (*fronds*) often much branched, circinate in vernation, rising from a rootstock: spores of one kind, borne on the under surface or margins of the leaves in sporangia (with an elastic ring), which are developed from a single epidermal cell (hence modified trichomes): prothallus above ground, green. — The sporangia are usu-

ally collected in little masses (fruit-dots or *sori*), which are often covered by a scale (*indusium*), which is produced by a cellular outgrowth from the frond, or by a general involucre formed from the infolded margin of the frond. — Eaton, Ferns of North America.

Tribe I. Sori round or oblong, placed on the veins or at the ends of the veins, without indusium. Stalk articulated to the rootstock. Veins free or reticulated. — POLYPODIEÆ.

1. **Polypodium.** Character of the tribe.

Tribe II. Sori more or less elongated, without indusium, on the back of the frond or its divisions, and usually following the veins, or only at the tips of the latter. Fronds often scaly or tomentose, or covered beneath with colored powder. — GRAMMITIDEÆ.

2. **Notholæna.** Sori but little elongated, often of very few sporangia, placed below the tips of the veins near the margin of the lobes of the frond.

Tribe III. Sori close to the margin of the frond or its divisions, sometimes extending down the veins, covered (at least when young) by an involucre opening inward and either consisting of the margin or produced from it. — PTERIDEÆ.

3. **Cheilanthes.** Sori minute, at the ends of the unconnected veins, covered by a usually interrupted involucre. — Small ferns, often woolly, chaffy, or pulverulent.
4. **Pellæa.** Sori near the ends of the veins, often confluent. Involucre membranaceous, continuous round the pinnules. Sterile and fertile fronds much alike and smooth; the stalk dark-colored.
5. **Cryptogramme.** Sori extending down the free veins. Involucre very broad, at length flattened out and exposing the now confluent sori. Sterile and fertile fronds unlike, smooth; the stalk light-colored.
6. **Pteris.** Sporangia borne on a continuous vein-like marginal receptacle, which connects the ends of the veins. Involucre continuous round the pinnules. Stalk light-colored.
7. **Adiantum.** Sporangia borne at the ends of the veins, on the under side of the reflexed margin of the frond. Midvein of the pinnules mostly eccentric or dissipated into forking veinlets. Stalk dark-colored.

Tribe IV. Sori more or less elongated, borne on veins oblique to the midvein, covered by a usually flattened indusium, which is attached to the fertile veinlet by one edge and free at the other. — ASPLENIEÆ.

8. **Asplenium.** Sori on the upper side of the fertile veinlet, less commonly on both sides of it. Veins free.

Tribe V. Sori round or roundish, on the back or sometimes at the tip of the fertile veinlets, naked or with an indusium. Stalk not articulated to the rootstock. — ASPIDIEÆ.

9. **Phegopteris.** Sori dot-like, minute, borne on the back of the fruiting veinlets; indusium none.
10. **Aspidium.** Sori round, borne on the back or at the apex of the veinlets; indusium orbicular or round-reniform. — Mostly large ferns.
11. **Cystopteris.** Indusium convex, delicate, fixed across the back of the veinlet by a broad base, usually turned back by the ripening sporangia. — Delicate ferns with small fronds.
12. **Woodsia.** Indusium placed beneath the sorus, and partly or wholly enclosing it, divided into irregular lobes or into a delicate fringe. — Fronds small.

1. POLYPODIUM, L. POLYPODY.

In ours the veins are uniformly free.

1. **P. vulgare,** L. Fronds evergreen, subcoriaceous, 2 to 10 inches long, ovate-oblong to oblong-linear, pinnatifid into linear-oblong obtuse or acute

segments, the lowest ones rarely diminished: veins branched into 3 or 4 veinlets, the lowest ones on the upper side of the vein bearing at their thickened ends the subglobose sori midway between the midrib and the margin of the segments. — From the Rocky Mountains eastward to the Atlantic; also westward.

2. NOTHOLÆNA, R. Brown.

In ours the fronds are 3 to 5-pinnate, and covered beneath with a white or yellow powder, the primary and secondary pinnæ distinctly stalked, and the ultimate pinnules very small, oval or 2 to 3-lobed.

1. **N. Fendleri,** Kunze. Frond 2 to 5 inches long, broadly deltoid-ovate, 4 to 5-pinnate; rhachis and all its branches flexuous and zigzag, the pinnæ alternate; ultimate pinnules 1 to 2 lines long. — From Colorado to Arizona and Texas. In clefts of exposed rocks.

N. DEALBATA, Kunze, reported near the eastern and southern limits of our range, very likely occurs within it. It is closely allied to *N. Fendleri*, but may be distinguished by its smaller fronds, which are triangular-ovate and 3 or 4-pinnate, straight rhachis and branches, mostly opposite pinnæ, and ultimate pinnules hardly a line long.

3. CHEILANTHES, Swartz. LIP-FERN.

Small ferns, with 2 to 4-pinnate fronds, and the under surface either smooth or variously covered with hair, wool, scales, or waxy powder. Ours belong to the section in which the involucres are continuous around the greater part of the margin of the very minute and bead-like ultimate segments, and the lower surface of the fronds tomentose or scaly.

* *Fronds tomentose beneath, but not scaly.*

1. **C. lanuginosa,** Nutt. *Fronds 2 to 4 inches long,* ovate-lanceolate, tripinnate or bipinnate with pinnatifid pinnules; ultimate segments less than a line long; *upper surface scantily tomentose, the lower surface matted with jointed woolly hairs; involucres herbaceous, very narrow.* — From Arizona and Colorado to British America and eastward to Wisconsin and Illinois. Grows in dense tufts on dry exposed rocks.

2. **C. Eatoni,** Baker. Stalks with narrow scales as well as hairs: *fronds 4 to 9 inches long,* oblong-lanceolate, *above woolly-pubescent, beneath matted-tomentose and partly scaly,* tripinnate; ultimate segments ½ line long, rounded obovate; margin continuously recurved, *the edge membranaceous.* — Colorado and Arizona to Texas.

* * *Fronds very scaly beneath, tomentum scanty or none.*

3. **C. Fendleri,** Hook. Rootstock slender; its scales loose and nerveless: frond 3 to 6 inches long, tripinnate; ultimate pinnules rounded and entire or obovate and 2 to 3-lobed, covered beneath with broadly ovate, acuminate scales, which are sometimes sparingly ciliate at base. — From Colorado to Arizona and Texas. In crevices of rocks.

4. PELLÆA, Link. Cliff-Brake.

Allied to *Cheilanthes*, from which it differs chiefly in the continuous involucre and smooth fronds (without tomentum or scales).

* *Fronds herbaceous or sub-coriaceous; veins clearly visible; involucre broad and usually covering the sporangia till they are fully ripe.*

1. **P. Breweri,** Eaton. *Rootstock short, densely covered with narrow fulvous chaff:* fronds membranaceous, 2 to 6 inches long, simply pinnate with mostly *unequally* 2-*lobed pinnæ*. — Proc. Am. Acad. vi. 555. From Colorado to Utah and California. In clefts of rocks.

2. **P. gracilis,** Hook. *Rootstock very slender, creeping, nearly naked: fronds very delicate*, 2 to 4 inches long, oblong-ovate, pinnate with a few *once or twice pinnatifid pinnæ;* segments oblong or obovate; involucres broad and delicate. — From Colorado northward, eastward through British America, and southward again into Iowa, Pennsylvania, etc. Crevices of damp and shaded limestone rocks.

* * *Fronds subcoriaceous or coriaceous; veins rather obscure; involucre conspicuous.*

+ *Pinnules obtuse, at least not mucronate: fronds* 1 *to* 2-*pinnate.*

3. **P. atropurpurea,** Fée. Frond 6 to 12 inches long, evergreen, nearly smooth, ovate-lanceolate, usually bipinnate below, simpler upwards; pinnules oval to linear-oblong, ½ to 2 inches long. — From Arizona and Alabama northward to British America and Canada. Crevices of shaded limestone rocks.

+ + *Pinnules decidedly acute or mucronate.*

4. **P. Wrightiana,** Hook. *Fronds* 4 *to* 8 *inches long*, lanceolate to triangular-ovate, *bipinnate;* pinnæ longer than broad, having 3 to 13 *oval or oblong-oval pinnules*, fertile ones with the margins rolled in to the midvein. — From Colorado and Arizona to W. Texas. Mostly in exposed rocky places, especially in cañons.

5. **P. densa,** Hook. *Fronds* 1½ *to* 2 *inches long*, ovate, *closely tripinnate; ultimate segments linear*, 3 to 6 lines long, sessile, sterile ones serrated. — In California and Oregon; also at Jackson's Lake, Wyoming (*Coulter*). Clefts of rocks.

5. CRYPTOGRAMME, R. Brown. Rock-Brake.

Fronds rather small, and smooth, 2 to 4-pinnate, the fertile ones taller than the sterile: stalks stramineous and tufted on a short rootstock.

1. **C. acrostichoides,** R. Br. Fronds 2 to 4 inches long, chartaceous, ovate, closely 2 to 4-pinnate; pinnules ovate or obovate, adnate-decurrent, those of the fertile fronds narrower and longer, the involucres very broad: sori extending far down the veinlets. — *Allosorus acrostichoides*, Spreng. From California, Colorado, and Lake Superior, northward to Arctic America. In dense patches among rocks.

6. PTERIS, L. · Bracken.

In ours the rootstock is cord-like, and the fronds scattered, ternate, with decompound divisions.

1. **P. aquilina,** L. Frond often very large, subcoriaceous, broadly triangular, primary divisions stalked; pinnæ mostly pinnately lobed with several to many rather short obtuse lobes, and with a sometimes very long subentire apex. — Common everywhere, being the most widely distributed of ferns.

7. ADIANTUM, L. Maidenhair.

Stalk mostly blackened or very dark purplish-brown and commonly highly polished.

1. **A. Capillus-Veneris,** L. *Fronds pyramidal, with the rhachis continuous to the terminal pinnule,* 9 to 18 inches long, often pendent, ovate or ovate-lanceolate, 2 *to* 3-*pinnate at base; pinnules wedge-obovate or rhomboid,* ½ to 1 inch long, *deeply and irregularly incised,* smooth; involucres lunulate or transversely oblong. — From S. California to Utah, Arizona, Texas, and eastward to Virginia and Florida. In moist rocky places, especially about springs and along water-courses.

2. **A. pedatum,** L. *Frond often a foot broad; stalk forked at the top, the branches recurved, and bearing several pinnate divisions on the upper side;* primary divisions 6 to 14, bearing numerous *oblong or triangular-oblong pinnules, which have the lower margin entire and the upper more or less lobed;* involucres oblong-lunate or transversely linear. — Across the continent and far northward, but apparently unreported as yet from our immediate range. In rich moist woods, especially among rocks.

8. ASPLENIUM, L. Spleenwort.

Fronds varying from simple to highly decompound.

* *Indusium straight or nearly so, attached to the upper side of the vein, rarely double.*

†– *Fronds once pinnate, the pinnæ numerous and sometimes toothed but not again divided, somewhat rigid: rhachis dark and often polished.*

1. **A. Trichomanes,** L. *Fronds usually* 4 *to* 6 *inches long, narrowly linear,* pinnate; pinnæ subsessile, *roundish-oval or oval-oblong from an obtusely cuneate or truncate base, entire or crenulate,* rarely incised, falling separately from the persistent rhachis. — Common throughout the United States and northward into British America. Crevices of shaded rocks.

2. **A. ebeneum,** Ait. *Fronds* 9 *to* 18 *inches high, linear-oblanceolate,* pinnate; pinnæ 6 to 18 lines long, firmly membranaceous, mostly alternate, sessile, spreading, *oblong or oblong-linear, somewhat auricled, crenately serrate or incised:* sori near the midvein. — Greenhorn Mountains, Colorado (*Greene*), Indian Territory, and eastward to Canada and Florida.

+ + *Fronds more than once pinnate or pinnatifid.*

3. **A. septentrionale,** Hoffm. Fronds 3 to 6 inches high, subcoriaceous, the stalk alternately forked; branches widening into a few (2 to 5) very narrowly cuneate and acuminate entire or sparingly toothed segments: veins closely parallel and forking: sori elongated, 1 to 3 to a segment. — Colorado and New Mexico. In crevices of rocks.

* * *Indusia variously curved, often crossing the fertile veinlet and continued a short distance down the other side of it.*

4. **A. Filix-fœmina,** Bernh. Fronds 1 to 3 feet long, softly membranaceous, oblong-lanceolate, 2 to 3-pinnate; pinnules adnate to the secondary rhachis, ovate to elongated-lanceolate, variously toothed or incised: indusia lacerate-ciliate. — Common almost everywhere.

9. PHEGOPTERIS, Fée.

Sori on the back of the veins below their attenuated apices. Differs from *Aspidium* only in having no indusium. In our species the fronds are triangular, ternate, the primary divisions stalked, and the rhachis is not winged.

1. **P. Dryopteris,** Fée. *Fronds smooth and thin,* 4 to 10 inches wide and long; *lateral divisions divergent;* all triangular and pinnate, the pinnæ pinnatifid into oblong, obtuse, entire or even pinnately lobed segments; *lowest inferior pinna of the lateral divisions equal to the second pinna of the middle division.* — From the mountains of Colorado to Oregon, eastward through the Northern United States, and far northward. Open rocky woods.

2. **P. calcarea,** Fée. *Fronds minutely glandular and somewhat rigid,* 4 to 8 inches wide and long; *lateral divisions ascending;* all triangular and pinnate, the pinnæ pinnatifid into oblong obtuse or even pinnately-lobed segments; *lowest inferior pinna of the lateral divisions equal to the third pinna of the middle division.* — Collected in Minnesota (*Miss Cathcart*), but, according to Professor Eaton, to be expected from Lake Superior to Idaho.

10. ASPIDIUM, Swartz. Shield Fern. Wood Fern.

The round indusia attached to the middle of the sorus by a short central stalk, or roundish-reniform and attached at the base of the sinus.

* *Indusium roundish-reniform or orbicular with a narrow sinus: in ours the fronds are larger, subcoriaceous or nearly so.*

1. **A. Filix-mas,** Swartz. Fronds 1 to 3 feet long, broadly oblong-lanceolate, somewhat narrowed and twice pinnate towards the base; pinnæ lanceolate-acuminate from a broad base; pinnules or segments oblong to ovate-lanceolate, obtuse or acute, toothed or incised, not glandular but sometimes slightly chaffy beneath, the upper confluent: sori near the midvein, commonly only on the lower half of each segment: stalks very chaffy with large scales. — Occurs generally throughout the continent, in several varieties. In Colorado and Dakota the following form has been found: —

Var. **incisum,** Mett. Differs from the type in the rhachis with scanty chaff; the pinnules or segments rather distant, lanceolate, tapering to a subacute point, and incised on the margin with serrated lobules. — Eaton, Ferns N. Am. i. 312.

A. SPINULOSUM, Swartz, a very widely distributed and variable species, is probably to be found within our range to the north and east. It has fronds 1 to 3 feet long, ovate to ovate-oblong, fully twice pinnate and but little narrowed at base; pinnæ short-stalked, the lowest ones triangular-lanceolate, upper ones gradually narrower; pinnules oblong, pinnate or pinnately incised with spinulose-serrate lobes: indusium either smooth or glandular.

* * *Indusium orbicular and entire, fixed by the depressed centre to the middle of the sorus: pinnæ and pinnules often auricled on the upper side of the base.*

2. **A. Lonchitis,** Swartz. Fronds simply pinnate, 6 to 18 inches long (stalks only 1 to 3 inches), linear-lanceolate; pinnæ broadly lanceolate, falcate, sharply spinulose-serrate, the lower ones symmetrically triangular and shorter, the upper ones strongly auricled. — In the Wahsatch Mountains, Utah, Montana, northward to British Columbia, and eastward to the Great Lakes.

11. CYSTOPTERIS, Bernhardi.

Tufted ferns, with slender and delicate twice or thrice pinnate fronds, and cut-toothed lobes.

1. **C. fragilis,** Bernh. Fronds 6 to 12 inches long, broadly lanceolate, usually bipinnate; pinnæ oblong-ovate, pointed; pinnules ovate or oblong, variously toothed or incised. — Throughout North America. Usually in crevices of shaded rocks and among stones.

12. WOODSIA, R. Brown.

Small tufted ferns growing on exposed rocks. Ours have the stalks not articulated, and the fronds glandular-pubescent or smooth, not chaffy.

1. **W. scopulina,** Eaton. Fronds 4 to 8 inches long, *puberulent beneath with minute jointed hairs and stalked glands,* oblong-ovate, pinnate with deeply pinnatifid pinnæ, the lobes oblong-ovate and crenulate: *indusia deeply cleft into narrow segments terminating in jointed hairs.* — From Colorado westward to California and Oregon, and eastward to Dakota and Minnesota. In dense masses on rocks and in crevices.

2. **W. Oregana,** Eaton. Very similar, but with *smooth fronds,* the fertile taller than the sterile: the *indusium reduced to a few moniliform hairs.* — From Arizona and Colorado to British Columbia and Lake Superior. Habits like the last.

Class III. EQUISETINÆ.

Plants with a hollow, elongated, grooved or striate, and jointed stem, bearing at each node a whorl of narrow united leaves which form a close sheath. The branches, arising from the axils of these leaves, are therefore in whorls.

Order 97. **EQUISETACEÆ.** (Horsetail Family.)

Stems arising from subterranean rootstocks. Sterile leaves resembling a toothed sheath at the joints; the fertile ones shield-shaped, bearing sporangia on the under side, and forming a terminal spike or cone.

1. **EQUISETUM,** L. Horsetail. Scouring Rush.

Stems simple or branched, the joints having closed ends: leaves of the fruiting cone 5 to 7-angled, and sporangia hood-like: spores round, furnished with two slender filaments attached by the middle and clavate at the free ends: prothallus above ground, green, usually dicœcious.

* *Stems of two kinds; the fertile (in spring) soft, pale or brownish; the sterile appearing later, herbaceous and very different; neither surviving the winter: stomata scattered.*

1. **E. arvense,** L. Fertile stems 4 to 10 inches high, with loose and usually distant about 8 to 12-toothed sheaths, *remaining simple and soon perishing:* sterile stems slender, at length 1 to 2 feet high, 10 to 14-furrowed, producing long and simple or sparingly branched 4-*angular branches; their teeth* 4. — Across the continent, but more common eastward; also far northward. The "Common Horsetail."

2. **E. pratense,** Ehrh. *Sterile and finally also fertile stems producing simple straight* 3-*angled branches:* sheaths of the stem with ovate-lanceolate short teeth, *those of the branches* 3-*toothed:* stems more slender and branches shorter than in the last. — Colorado to Michigan and northward.

* * *Stems all alike, evergreen, mostly unbranched: fruit produced in summer: stomata in regular rows.*

+– *Stems tall and stout* (1½ *to* 6 *feet high*), *mostly simple, evenly* 15 *to* 40-*grooved: sheaths appressed.*

3. **E. lævigatum,** Braun. Stems 1½ to 4 feet high, sometimes with numerous branches; the *ridges convex, obtuse, smooth or minutely roughish* with minute tubercles: *sheaths elongated,* with a narrow black limb and about 22 *linear-awl-shaped caducous teeth,* 1-*keeled below.* — From Colorado to Oregon, and eastward to Illinois and Louisiana.

4. **E. robustum,** Braun. Stems 3 to 6 feet high; the *ridges narrow, rough with one line of tubercles: sheaths short,* with a black girdle above the base, rarely with a black limb, and about 40 *deciduous 3-keeled teeth with ovate-awl-shaped points.* — From British America to Mexico, and extending eastward to Louisiana and Ohio.

5. **E. hiemale,** L. Stems 1½ to 4 feet high; the *ridges roughened by two more or less distinct lines of tubercles: sheaths elongated,* with a black girdle above the base and a black limb, of about 20 (17 to 26) *narrowly linear teeth; 1-keeled at the base and with awl-shaped deciduous points.* — In Utah and Wyoming, to British America and the Atlantic States. The "Scouring Rush," or "Shave Grass."

+– +– *Stems slender, in tufts,* 5 *to* 10*-grooved, sheaths looser.*

6. **E. variegatum,** Schleicher. *Stems ascending,* 6 to 18 inches long, usually simple from a branched base, 5 *to* 10*-grooved:* sheaths green variegated with black above; *the* 5 *to* 10 *teeth* tipped with a deciduous bristle. — Clear Creek, Colorado (*Coulter*), Utah, and Wyoming; also in the Atlantic States and northward.

7. **E. scirpoides,** Michx. *Stems very numerous in a tuft, filiform,* 3 to 6 inches high, *flexuous and curving, mostly* 6*-grooved,* with acute ridges: *sheaths* 3*-toothed,* the bristle-pointed teeth more persistent. — Utah and Wyoming; also in the North Atlantic States and northward.

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ADDENDUM.

On page 380, after *C. frigida*, All., insert: —

28 a. **C. misandra,** R. Br. Slender, 3 to 8 inches high: leaves many, narrow, 1 to 3 inches long: sheaths purplish, leafless, usually tipped by a short setaceous bract: terminal spike pistillate above: spikes all ovate ($\frac{1}{2}$ inch or less long), dull brown, hanging on slender peduncles from a half-inch to an inch long: perigynium lanceolate, rough or serrate on the two margins, the lower half occupied by the nearly flat 3-ribbed obovate akene, longer than the obtuse brown scale. — *C. fuliginosa*, St. & Hoppe. In dense sod on Gray's Peak, Colorado (*H. N. Patterson*, 1885); also in Arctic America. (Eu.) *C. misandra* is the more recent name, but Sternberg and Hoppe applied the name *C. fuliginosa* to this species, thinking it to be the *C. fuliginosa* of Schkuhr, which is *C. frigida*, All. The species was first distinguished by Robert Brown.

GLOSSARY

OR

DICTIONARY OF TERMS USED IN DESCRIBING PLANTS.

A, at the beginning of words of Greek derivation, commonly signifies a negative, or the absence of something; as, *a*petalous, without petals; *a*phyllous, leafless, &c. If the word begins with a vowel, the prefix is *an*, as, *an*antherous, destitute of anther.

Abnormal: contrary to the usual or the natural structure.

Abortive: imperfectly formed, or rudimentary.

Abrupt: suddenly terminating; as, for instance,

Abruptly pinnate: pinnate without an odd leaflet at the end.

Acaulescent (*acaulis*): apparently stemless; the proper stem, bearing the leaves and flowers, being very short or subterranean.

Accéssory: something additional; as *Accessory buds.*

Accrescent: growing larger after flowering, as the calyx of Physalis.

Accumbent: lying against a thing. The cotyledons are accumbent when they lie with their edges against the radicle.

Acerose: needle-shaped, as the leaves of Pines.

Achenium (plural *achenia*): a one-seeded, seed-like fruit.

Achlamýdeous (flower): without floral envelopes.

Acícular: needle-shaped; more slender than acerose.

Acorn: the nut of the Oak.

Acotylédonous: destitute of cotyledons or seed-leaves.

Acrógenous: growing from the apex, as the stems of Ferns and Mosses.

Acrogens, or *Acrogenous Plants:* the higher Cryptogamous plants, such as Ferns, &c.

Acúleate: armed with prickles, i. e. *aculei;* as the Rose and Brier.

Acúleolate: armed with small prickles, or slightly prickly.

Acúminate: taper-pointed.

Acute: merely sharp-pointed, or ending in a point less than a right angle.

Adelphous (stamens): joined in a fraternity (*adelphia*): see *monadelphous* and *diadelphous.*

Adherent: sticking to, or, more commonly, growing fast to another body.

Adnate: growing fast to; it means born adherent. The anther is adnate when fixed by its whole length to the filament or its prolongation.

Adpressed, or *appressed:* brought into contact, but not united.

Adscendent, ascendent, or *ascending:* rising gradually upwards.
Adsurgent, or *assurgent:* same as ascending.
Adventitious: out of the proper or usual place.
Adventive: applied to foreign plants accidentally or sparingly spontaneous in a country, but hardly to be called naturalized.
Æquilateral: equal-sided; opposed to oblique.
Æstivation: the arrangement of parts in a flower-bud.
Air-cells, or *Air-passages:* spaces in the tissue of leaves and some stems.
Akénium, or *akene.* See *achenium.*
Ala (plural *alæ*): a wing; the side-petals of a papilionaceous corolla.
Albescent: whitish, or turning white.
Albúmen of the seed: nourishing matter stored up with the embryo, but not within it.
Albuminous (seeds): furnished with albumen.
Alpine: belonging to high mountains above the limit of forests.
Altérnate (leaves): one after another. Petals are *alternate with* the sepals, or stamens with the petals, when they stand over the intervals between them.
Alvéolate: honeycomb-like, as the receptacle of the Cotton-Thistle.
Ament: a catkin. *Amentaceous:* catkin-like, or catkin-bearing.
Amorphous: shapeless; without any definite form.
Amphítropous (ovules or seeds): half inverted, the micropyle and chalaza being at opposite ends, and the hilum about half way between.
Ampléctant: embracing. *Amplexicaul* (leaves): clasping the stem by the base.
Ampullàceous: swelling out like a bottle or bladder.
Anántherous: without anthers. *Anánthous:* destitute of flowers; flowerless.
Anástomosing: forming a net-work (*anastomosis*), as the veins of leaves.
Anátropous: (ovules or seeds): inverted, the micropyle and chalaza being at opposite ends, and the hilum near the micropyle.
Ancípital (*anceps*); two-edged.
Andrœcium: a name for the stamens taken together.
Andrógynous: having both staminate and pistillate flowers in the same cluster or inflorescence.
Angiospérmæ, Angiospérmous Plants: with their seeds formed in an ovary or pericarp.
Annual (plant): flowering and fruiting the year it is raised from the seed, and then dying.
Ánnular: in the form of a ring, or forming a circle.
Ánnulate: marked by rings; or furnished with an
Annulus, or ring, like that of the spore-case of most Ferns.
Anterior, in the blossom, is the part next the bract, i. e. external: — while the posterior side is that next the axis of inflorescence. Thus, in the Pea, &c. the keel is *anterior,* and the standard *posterior.*
Anther: the essential part of the stamen, which contains the pollen.
Antheríferous: anther-bearing.
Anthésis: the period or the act of the expansion of a flower.
Anthocárpous (fruits): same as multiple fruits.
Antrórse: directed upwards or forwards.

Apétalous: destitute of petals.
Aphýllous: destitute of leaves, at least of foliage.
Ápical: belonging to the apex or point.
Apículate: pointletted; tipped with a short and abrupt point.
Apocárpous (pistils): when the several pistils of the same flower are separate.
Appendage: any superadded part.
Appendículate: provided with appendages.
Appressed: where branches are close pressed to the stem, or leaves to the branch, &c.
Aquatic: living or growing in water; applied to plants whether growing under water, or with all but the base raised out of it.
Árachnoid: cobwebby; clothed with, or consisting of, soft downy fibres.
Arbóreous, Arborescent: tree-like, in size or form.
Árcuate: bent or curved like a bow.
Aréolate: marked out into little spaces or *areolæ.*
Árillate (seeds): furnished with an
Aril or *Arillus:* a fleshy growth forming a false coat or appendage to a seed.
Arístate: awned, i. e. furnished with an arista, like the beard of Barley, &c.
Arístulate: diminutive of the last; short-awned.
Arrow-shaped or *Arrow-headed:* same as *sagittate.*
Artículated: jointed; furnished with joints or *articulations,* where it separates or inclines to do so.
Ascending (seeds or ovules), directed obliquely upward.
Assurgent: same as ascending.
Aurículate: furnished with auricles or ear-like appendages.
Awl-shaped: sharp-pointed from a broader base.
Awn: the bristle or beard of Barley, Oats, &c.; or any similar bristle-like appendage.
Awned: furnished with an awn or long bristle-shaped tip.
Axil: the angle on the upper side between a leaf and the stem.
Axile: belonging to the axis; &c.
Axillary (buds, &c.): occurring in an axil.
Axis: the central line of any body; the organ round which others are attached; the root and stem.

Baccate: berry-like, of a pulpy nature like a berry (in Latin *bacca*).
Barbate: bearded; bearing tufts, spots, or lines of hairs.
Barbed: furnished with a *barb* or double hook; as the apex of the bristle on the fruit of Echinospermum (Stickseed), &c.
Bárbellate: said of the bristles of the pappus of some Compositæ (species of Liatris, &c.), when beset with short, stiff hairs, longer than when denticulate, but shorter than when plumose.
Barbéllulate: diminutive of barbellate.
Bark: the covering of a stem outside of the wood.
Basal: belonging or attached to the
Base: that extremity of any organ by which it is attached to its support.
Beaked: ending in a prolonged narrow tip.

Bearded: see *barbate*. *Beard* is sometimes used popularly for awn, more commonly for long or stiff hairs of any sort.

Bell-shaped: of the shape of a bell, as the corolla of Harebell.

Berry: a fruit pulpy or juicy throughout, as a grape.

Bi- (or *Bis*), in compound words: twice; as

Biarticulate: twice jointed, or two-jointed; separating into two pieces.

Biauriculate: having two ears.

Bicallose: having two callosities or harder spots.

Bicárinate: two-keeled, as the upper palea of Grasses.

Bicípital (*Biceps*): two-headed; dividing into two parts at the top or bottom.

Biconjugate: twice paired, as when a petiole forks twice.

Bidéntate: having two teeth (not twice or doubly dentate).

Biénnial: of two years' continuance; springing from the seed one season, flowering and dying the next.

Bifid: two-cleft to about the middle.

Bifóliolate: a compound leaf of two leaflets.

Bifúrcate: twice forked; or, more commonly, forked into two branches.

Bilábiate: two-lipped, as the corolla of sage, &c.

Bilámellate: of two plates (*lamellæ*), as the stigma of Mimulus.

Bilóbed: the same as two-lobed.

Bilócular: two-celled; as most anthers, the pod of Foxglove, most Saxifrages, &c.

Binate: in couples, two together.

Bipartite: the Latin form of two-parted.

Bipinnate (leaf): twice pinnate.

Bipinnátifid: twice pinnatifid, that is, pinnatifid with the lobes again pinnatifid.

Biplícate: twice folded together.

Biséríal, or *Biséríate:* occupying two rows, one within the other.

Biserrate: doubly serrate, as when the teeth of a leaf, &c. are themselves serrate.

Bitérnate: twice ternate; i.e. principal divisions 3, each bearing 3 leaflets, &c.

Bladdery: thin and inflated.

Blade of a leaf: its expanded portion.

Boat-shaped: concave within and keeled without, in shape like a small boat.

Bract (Latin, *bractea*). Bracts, in general, are the leaves of an inflorescence, more or less different from ordinary leaves. Specially, the bract is the small leaf or scale from the axil of which a flower or its pedicel proceeds; and a

Bractlet (*bracteola*) is a bract seated *on* the pedicel or flower-stalk.

Bristles: stiff, sharp hairs, or any very slender bodies of similar appearance.

Bristly: beset with bristles.

Bud: a branch in its earliest or undeveloped state.

Bud-scales: the modified leaves of the bud.

Bulb: a leaf-bud with fleshy scales, usually subterranean.

Bulbíferous: bearing or producing bulbs.

Bulbose, or *bulbous:* bulb-like in shape, &c.
Bulblets: small bulbs, borne above ground, as on the stems of the bulb-bearing Lily.
Bulb-scales: the modified leaves of bulbs.
Bullate: appearing as if blistered or bladdery (from *bulla*, a bubble).

Caducous: dropping off very early, compared with other parts; as the calyx in the Poppy family, falling when the flower opens.
Cæspitose, or *Cespitose:* growing in turf-like patches or tufts, like most sedges, &c.
Calcarate: furnished with a spur (*calcar*), as the flower of Larkspur and Violet.
Calcéolate or *Calceiform:* slipper-shaped, like one petal of the Lady's Slipper.
Callose: hardened; or furnished with callosities or thickened spots.
Calyculate: furnished with an outer accessory calyx (*calyculus*) or set of bracts looking like a calyx.
Calyptriform: shaped like a calyptra or candle-extinguisher.
Calyx: the outer set of the floral envelopes or leaves of the flower.
Campánulate: bell-shaped.
Campylótropous: curved ovules and seeds, the chalaza and hilum being near together, and the micropyle at the other end of the curved axis.
Canaliculate: channelled, or with a deep longitudinal groove.
Cáncellate: latticed, resembling lattice-work.
Canescent: grayish-white; hoary, usually because the surface is covered with fine white hairs. *Incanous* is whiter still.
Capilláceous, *Capillary:* hair-like in shape; as fine as hair or slender bristles.
Capitate: having a globular apex, like the head on a pin; as the stigma of Cherry; or forming a head, like the flower-cluster of Button-bush.
Capitéllate: diminutive of capitate.
Capítulum (a little head): a close rounded dense cluster or head of sessile flowers.
Capréolate: bearing tendrils (from *capreolus*, a tendril).
Capsule: a pod; any dry dehiscent seed-vessel.
Cápsular: relating to, or like a capsule.
Carina: a keel; the two anterior petals of a papilionaceous flower, which are combined to form a body shaped somewhat like the keel (or rather the prow) of a vessel.
Cárinate; keeled; furnished with a sharp ridge or projection on the lower side.
Cariópsis, or *Caryópsis:* the one-seeded fruit or grain of Grasses, &c.
Cárneous: flesh-colored; pale red.
Cárnose: fleshy in texture.
Cárpel, or *Carpídium:* a simple pistil, or one of the parts or leaves of which a compound pistil is composed.
Cárpellary: pertaining to a carpel.
Cárpophore: the stalk or support of a fruit or pistil within the flower.
Cartiláginous, or *Cartilagineous:* firm and tough, like cartilage, in texture.

Cáruncle : an excrescence at the scar of some seeds; as those of Polygala.
Carúnculate : furnished with a caruncle.
Caryophylláceous : pink-like : applied to a corolla of 5 long-clawed petals.
Catkin : a scaly deciduous spike of flowers, an ament.
Caudate : tailed, or tail-pointed.
Caudex : a sort of trunk, such as that of Palms ; an upright rootstock.
Caulescent : having an obvious stem.
Caúlicle : a little stem, or rudimentary stem.
Caúline : of or belonging to a stem (*caulis*, in Latin).
Cell (diminutive *Cellule*) : the cavity of an anther, ovary, &c., one of the elements or vesicles of which plants are composed.
Centrifugal (inflorescence) : produced or expanding in succession from the centre outwards. The radicle is centrifugal, when it points away from the centre of the fruit.
Centripetal : the opposite of centrifugal.
Cereal : belonging to corn, or corn-plants.
Cérnuous : nodding ; the summit more or less inclining.
Chaff : small membranous scales or bracts on the receptacle of Compositæ; the glumes, &c. of Grasses.
Chaffy : furnished with chaff, or of the texture of chaff.
Chaláza : that part of the ovule where all the parts grow together.
Channelled : hollowed out like a gutter; same as *canaliculate.*
Character : a phrase expressing the essential marks of a species, genus, &c. which distinguish it from all others.
Chartáceous : of the texture of paper or parchment.
Chlórophyll : the green grains in the cells of the leaf, and of other parts exposed to the light, which give to herbage its green color.
Cíliate : beset on the margin with a fringe of *cilia*, i. e. of hairs or bristles, like the eyelashes fringing the eyelids, whence the name.
Cinéreous, or *Cineráceous :* ash-grayish ; of the color of ashes.
Círcinate : rolled inwards from the top, like a crosier, as the shoots of Ferns.
Circumscissile, or *Circumcissile :* divided by a circular line round the sides, as the pods of Purslane, Plantain, &c.
Circumscription : the general outline of a thing.
Cirrhiferous, or *Cirrhose :* furnished with a tendril (Latin, *cirrhus*); as the Grape-vine. *Cirrhose* also means resembling or coiling like tendrils, as the leaf-stalks of Virgin's-bower.
Cláthrate : latticed; same as *cancellate.*
Clávate : club-shaped ; slender below and thickened upwards.
Claw : the narrow or stalk-like base of some petals, as of Pinks.
Climbing : rising by clinging to other objects.
Club-shaped : see *clavate.*
Clustered : leaves, flowers, &c. aggregated or collected into a bunch.
Clýpeate : buckler-shaped.
Coalescent : growing together.
Coarctate : contracted or brought close together.
Cobwebby : same as *arachnoid ;* bearing hairs like cobwebs or gossamer.
Cóccus (plural *cocci*) : anciently a berry ; now mostly used to denote the

carpels of a dry fruit which are separable from each other, as of Euphorbia.

Cochleáriform: spoon-shaped.

Cóchleate: coiled or shaped like a snail-shell.

Coherent, in Botany, is usually the same as *connate.*

Collum or *Collar:* the neck or line of junction between the stem and the root.

Columélla: the axis to which the carpels of a compound pistil are often attached, as in Geranium, or which is left when a pod opens, as in Azalea and Rhododendron.

Column: the united stamens, as in Mallow, or the stamens and pistils united into one body, as in the Orchis family.

Columnar: shaped like a column or pillar.

Coma: a tuft of any sort (literally, a head of hair).

Cómose: tufted; bearing a tuft of hairs, as the seeds of Milkweed.

Cómmissure: the line of junction of two carpels, as in the fruit of Umbelliferæ, such as Parsnip, Caraway, &c.

Common: used as "general," in contradistinction to "partial"; e. g. "common involucre."

Cómplanate: flattened.

Complete (flower), with the four floral organs.

Complicate: folded upon itself.

Compressed: flattened on two opposite sides.

Condúplicate: folded upon itself lengthwise, as are the leaves of Magnolia in the bud.

Cone: the fruit of the Pine family.

Cónfluent: blended together: or the same as *coherent.*

Confórmed: similar to another thing it is associated with or compared to; or closely fitted to it, as the skin to the kernel of a seed.

Congésted, Conglómerate: crowded together.

Conjugate: coupled; in single pairs.

Connate: united or grown together from the first.

Connéctive, Connectívum: the part of the anther connecting its two cells.

Connívent: converging, or brought close together.

Continuous: the reverse of interrupted or articulated.

Contorted: twisted together. *Contorted æstivation:* same as *convolute.*

Contracted: either narrowed or shortened.

Contrary: turned in an opposite direction to another organ or part with which it is compared.

Convolute: rolled up lengthwise, as the leaves of the Plum in vernation. In æstivation, same as *contorted.*

Cordate: heart-shaped.

Coriaceous: resembling leather in texture.

Corky: of the texture of cork. *Corky layer* of bark.

Corm, Cormus: a solid bulb, like that of Crocus.

Córneous: of the consistence or appearance of horn, as the albumen of the seed of the Date, Coffee, &c.

Cornículate: furnished with a small horn or spur.

Corólla: the leaves of the flower within the calyx.

Corollaceous, Corolline: like or belonging to a corolla.

Corona: a coronet or crown; an appendage at the top of the claw of some petals, as Silene and Soapwort, or of the tube of the corolla of Hound's-Tongue, &c.

Coronate: crowned; furnished with a crown.

Cortical: belonging to the bark (*cortex*).

Corymb: a sort of flat or convex flower-cluster.

Corymbose: approaching the form of a corymb, or branched in that way; arranged in corymbs.

Costa: a rib; the midrib of a leaf, &c. *Costate:* ribbed.

Cotylédons: the first leaves of the embryo.

Cratériform: goblet-shaped; broadly cup-shaped.

Creeping (stems): growing flat on or beneath the ground and rooting.

Crémocarp: a half-fruit, or one of the two carpels of Umbelliferæ.

Crenate, or *Crenelled:* the edge scalloped into rounded teeth.

Crested, or *Cristate:* bearing any elevated appendage like a crest.

Cribrose: pierced like a sieve with small apertures.

Crown: see *corona*.

Crowning: borne on the apex of anything.

Cruciate, or *Cruciform:* cross-shaped, as the four spreading petals of the Mustard, and all the flowers of that family.

Crustaceous: hard, and brittle in texture; crust-like.

Cryptógamous, or *Cryptogamic:* relating to Cryptogamia.

Cucúllate: hooded, or hood-shaped, rolled up like a cornet of paper, or a hood (*cucullus*), as the spathe of Indian Turnip.

Culm: a straw; the stem of Grasses and Sedges.

Cúneate, Cúneiform: wedge-shaped.

Cup-shaped: same as cyathiform, or near it.

Cúpule: a little cup; the cup to the acorn of the Oak.

Cúpulate: provided with a cupule.

Cúspidate: tipped with a sharp and stiff point.

Cut: same as incised, or applied generally to any sharp and deep division.

Cúticle: the skin of plants, or more strictly its external pellicle.

Cyáthiform: in the shape of a cup, or particularly of a wine-glass.

Cycle: one complete turn of a spire, or a circle.

Cyclical: rolled up circularly, or coiled into a complete circle.

Cylíndraceous: approaching to the

Cylíndrical form; as that of stems, &c., which are round, and gradually if at all tapering.

Cýmbæform, or *Cymbiform:* same as boat-shaped.

Cyme: a somewhat flat-topped cluster of centrifugal inflorescence.

Cýmose: furnished with cymes, or like a cyme.

Deca- (in composition of words of Greek derivation): ten; as

Decágynous: with 10 pistils or styles. *Decándrous:* with 10 stamens.

Deciduous: falling off, or subject to fall, said of leaves which fall in autumn, and of a calyx and corolla which fall before the fruit forms.

Declined: turned to one side, or downwards.

Decompound: several times compounded or divided.

Decumbent: reclined on the ground, the summit tending to rise.
Decurrent (leaves): prolonged on the stem beneath the insertion.
Decússate: arranged in pairs which successively cross each other.
Definite: when of a uniform number, and not above twelve or so.
Deflexed: bent downwards.
Dehiscence: the mode in which an anther or a pod regularly bursts or splits open.
Dehiscent: opening by regular dehiscence.
Deliquescent: branching off so that the stem is lost in the branches.
Deltoid: of a triangular shape, like the Greek capital Δ.
Demersed: growing below the surface of water.
Dendroid, Dendritic: tree-like in form or appearance.
Dentate: toothed (from the Latin *dens*, a tooth).
Denticulate: furnished with denticulations, or very small teeth: diminutive of the last.
Depauperate (impoverished or starved): below the natural size.
Depressed: flattened, or as if pressed down from above; flattened vertically.
Descending: tending gradually downwards.
Dextrorse: turned to the right hand.
Di- (in Greek compounds): two, as
Diádelphous (stamens): united by their filaments in two sets.
Diándrous: having two stamens.
Diáphanous: transparent or translucent.
Dichlamýdeous (flower): having both calyx and corolla.
Dichótomous: two-forked.
Diclínous: having the stamens in one flower, the pistils in another.
Dicóccous (fruit): splitting into two *cocci*, or closed carpels.
Dicotylédonous (embryo): having a pair of cotyledons.
Didymous: twin.
Didýnamous (stamens): having four stamens in two pairs, one pair shorter than the other.
Diffuse: spreading widely and irregularly.
Dígitate (fingered): where the leaflets of a compound leaf are all borne on the apex of the petiole.
Dígynous (flower): having two pistils or styles.
Dimerous: made up of two parts, or its organs in twos.
Dimídiate: halved; as where a leaf or leaflet has only one side developed, or a stamen has only one lobe or cell.
Dimorphous: of two forms.
Diœcious, or *Dioícous:* where the stamens and pistils are in separate flowers on different plants.
Dipétalous: of two petals. *Diphýllous:* two-leaved. *Dípterous:* two-winged.
Disciform or *Disk-shaped:* flat and circular, like a disk or quoit.
Disk: the face of any flat body; the central part of a head of flowers, like the Sunflower, or Coreopsis, as opposed to the *ray* or margin; a fleshy expansion of the receptacle of a flower.
Dissected: cut deeply into many lobes or divisions.
Dissépiments: the partitions of an ovary or a fruit.
Dístichous: two-ranked.

Distinct: uncombined with each other.
Diváricate: straddling; very widely divergent.
Divided (leaves, &c.): cut into divisions extending about to the base or the midrib.
Dodeca- (in Greek compounds): twelve; as
Dodecágynous: with twelve pistils or styles.
Dodecandrous: with twelve stamens.
Dolabriform: axe-shaped.
Dorsal: pertaining to the back (*dorsum*) of an organ.
Double Flowers, so called: where the petals are multiplied unduly.
Downy: clothed with a coat of soft and short hairs.
Drupe: a stone-fruit.
Drupaceous: like or pertaining to a drupe.
Dwarf: remarkably low in stature.
E-, or *Ex-*, at the beginning of compound words, means destitute of; as *ecostate*, without a rib or midrib; *exalbuminous*, without albumen, &c.
Eared: see *auriculate.*
Ebrácteate: destitute of bracts.
Echínate: armed with prickles (like a hedgehog). *Echínulate:* a diminutive of it.
Edentate: toothless.
Eglandulose: destitute of glands.
Ellipsoidal: approaching an elliptical figure.
Elliptical: oval or oblong, with the ends regularly rounded.
Emárginate: notched at the summit.
Émbryo: the rudimentary undeveloped plantlet in a seed.
Emersed: raised out of water.
Éndocarp: the inner layer of a pericarp or fruit.
Éndosperm: another name for the albumen of a seed.
Ensiform: sword-shaped; as the leaves of Iris.
Entire: the margins not at all toothed, notched, or divided, but even.
Ephemeral: lasting for a day or less, as the corolla of Purslane, &c.
Epi-, in composition: upon; as
Épicarp: the outermost layer of a fruit.
Epidermal: relating to the *Epidérmis*, or the skin of a plant.
Epigæous: growing on the earth, or close to the ground.
Epígynous: upon the ovary.
Epipétalous: borne on the petals or the corolla.
Epiphýllous: borne on a leaf.
Epiphyte: a plant growing on another plant, but not nourished by it.
Episperm: the skin or coat of a seed, especially the outer coat.
Equal: same as *regular;* or of the same number or length, as the case may be, of the body it is compared with.
Equally pinnate: same as abruptly pinnate.
Équitant (riding straddle).
Erose: eroded, as if gnawed.
Eróstrate: not beaked.
Estivátion: see *æstivation.*
Etiolated: blanched by excluding the light, as the stalks of Celery.

Evergreen: holding the leaves over winter and until new ones appear, or longer.

Exalbúminous (seed): destitute of albumen.

Excúrrent: running out, as when a midrib projects beyond the apex of a leaf, or a trunk is continued to the very top of a tree.

Explanate: spread or flattened out.

Exserted: protruding out of.

Exstípulate: destitute of stipules.

Extra-axillary: said of a branch or bud a little out of the axil.

Extrórse: turned outwards; the anther is extrorse when fastened to the filament on the side next the pistil, and opening on the outer side.

Falcate: scythe-shaped; a flat body curved, its edges parallel.

Farinaceous: mealy in texture. *Fárinose:* covered with a mealy powder.

Fásciate: banded; also applied to monstrous stems which grow flat.

Fáscicle: a close cluster.

Fáscicled, Fascículated: growing in a bundle or tuft, as the leaves of Pine and Larch.

Fastígiate: close, parallel, and upright, as the branches of Lombardy Poplar.

Favólate, Fávose: honeycombed; same as *alveolate.*

Feather-veined: where the veins of a leaf spring from along the sides of a midrib.

Female (flowers): with pistils and no stamens.

Fenéstrate: pierced with one or more large holes, like windows.

Ferrugineous, or *Ferruginous:* resembling iron-rust; red-grayish.

Fertile: fruit-bearing, or capable of producing fruit; also said of anthers when they produce good pollen.

Fertilization: the process by which pollen causes the embryo to be formed.

Fiddle-shaped: obovate with a deep recess on each side.

Filament: the stalk of a stamen; also any slender thread-shaped appendage.

Filaméntose, or *Filamentous:* bearing or formed of slender threads.

Filiform: thread-shaped; long, slender, and cylindrical.

Fímbriate: fringed; furnished with fringes (*fimbriæ*).

Fístular or *Fistulose:* hollow and cylindrical, as the leaves of the Onion.

Flabéliform or *Flabellate:* fan-shaped; broad, rounded at the summit, and narrowed at the base.

Flágellate, or *Flagélliform:* long, narrow, and flexible, like the thong of a whip; or like the runners (*flagellæ*) of the Strawberry.

Flavescent: yellowish, or turning yellow.

Fleshy: composed of firm pulp or flesh.

Fléxuose, or *Fléxuous:* bending gently in opposite directions, in a zigzag way.

Floating: swimming on the surface of water.

Flóccose: composed, or bearing tufts, of woolly or long and soft hairs.

Flora (the goddess of flowers): the plants of a country or district, taken together, or a work systematically describing them.

Floral: relating to the blossom.

Floral Envélopes: the leaves of the flower.

Floret: a diminutive flower; one of the flowers of a head (or of the so-called compound flower) of Compositæ.
Flower: the whole organs of reproduction of Phænogamous plants.
Flower-bud: an unopened flower.
Foliáceous: belonging to, or of the texture or nature of, a leaf (*folium*).
Fóliose: leafy; abounding in leaves.
Fóliolate: relating to or bearing leaflets (*foliola*).
Fóllicle: a simple pod, opening down the inner suture.
Follícular: resembling or belonging to a follicle.
Foramen: a hole or orifice, as that of the ovule.
Fornix: little arched scales in the throat of some corollas, as of Comfrey.
Fórnicate: over-arched, or arching over.
Fóveate: deeply pitted. *Foveólate:* diminutive of *foveate.*
Free: not united with any other parts of a different sort.
Fringed: the margin beset with slender appendages, bristles, &c.
Frond: what answers to leaves in Ferns; the stem and leaves fused into one body, as in Duckweed and many Liverworts, &c.
Fróndose: frond-bearing; like a frond: or sometimes used for leafy.
Fructification: the state of fruiting.
Fruit: the matured ovary and all it contains or is connected with.
Frutéscent: somewhat shrubby; becoming a shrub (*frutex*).
Frutículose: like a small shrub. *Frúticose:* shrubby.
Fugaciouś: soon falling off or perishing.
Fulvous: tawny; dull yellow with gray.
Funículus: the stalk of a seed or ovule.
Funnel-form, or *Funnel-shaped:* expanding gradually upwards, like a funnel or tunnel.
Fúrcate: forked.
Furfuráceous: covered with bran-like fine scurf.
Furrowed: marked by longitudinal channels or grooves.
Fuscous: deep gray-brown.
Fúsiform: spindle-shaped.

Gáleate: shaped like a helmet (*galea*); as the upper sepal of the Monkshood, and the upper lip of the corolla of Dead-Nettle.
Gamopétalous: of united petals; same as *monopetalous*, and a better word.
Gamophýllous: formed of united leaves. *Gamosépalous:* formed of united sepals.
Géminate: twin; in pairs; as the flowers of Linnæa.
Gemma: a bud.
Gemmation: the state of budding, or the arrangement of parts in the bud.
Genículate: bent abruptly, like a knee (*genu*), as many stems.
Genus: a kind; a rank above species.
Germ: a growing point; a young bud; sometimes the same as embryo.
Germination: the development of a plantlet from the seed.
Gibbous: more tumid at one place or on one side than the other.
Glabrate: becoming glabrous with age, or almost glabrous.
Glabrous: smooth, i. e. having no hairs, bristles, or other pubescence.
Gladiate: sword-shaped, as the leaves of Iris.

Glands: small cellular organs which secrete oily or aromatic or other products: they are sometimes sunk in the leaves or rind, as in the Orange, Prickly Ash, &c.; sometimes on the surface as small projections; sometimes raised on hairs or bristles (*glandular hairs, &c.*), as in the Sweet-brier and Sundew. The name is also given to any small swellings, &c., whether they secrete anything or not.

Glandular, Glandulose: furnished with glands, or gland-like.

Glans (*Gland*): the acorn or mast of Oak and similar fruits.

Glaucescent: slightly glaucous, or bluish-gray.

Glaucous: covered with a *bloom*, viz. with a fine white powder that rubs off, like that on a fresh plum, or a cabbage-leaf.

Globose: spherical in form, or nearly so. *Glóbular:* nearly globose.

Glochídiate (hairs or bristles): barbed; tipped with barbs, or with a double hooked point.

Glómerate: closely aggregated into a dense cluster.

Glómerule: a dense head-like cluster.

Glumaceous: glume-like, or glume bearing.

Glume: Glumes are the husks or floral coverings of Grasses, or, particularly, the outer husks or bracts of each spikelet.

Granular: composed of grains. *Granule:* a small grain.

Grumous or *Grumose:* formed of coarse clustered grains.

Guttate: spotted, as if by drops of something colored.

Gymnocárpous: naked-fruited.

Gymnospérmous: naked-seeded.

Gynándrous: with stamens borne on, i. e. united with, the pistil.

Gynœcium: a name for the pistils of a flower taken altogether.

Gýnobase; a particular receptacle or support of the pistils, or of the carpels of a compound ovary, as in Geranium.

Gýnophore: a stalk raising a pistil above the stamens, as in the Cleome Family.

Habit: the general aspect of a plant, or its mode of growth.

Habitat: the situation in which a plant grows in a wild state.

Hairs: hair-like projections or appendages of the surface of plants.

Hairy: beset with hairs, especially longish ones.

Halberd-shaped or *Halberd-headed:* see *hastate.*

Halved: when appearing as if one half of the body were cut away.

Hamate or *Hamose:* hooked; the end of a slender body bent round.

Hámulose: bearing a small hook; a diminutive of the last.

Hastate or *Hastile:* shaped like a halberd; furnished with a spreading lobe on each side at the base.

Heart-shaped: of the shape of a heart as commonly painted.

Helicoid: coiled like a *helix* or snail-shell.

Helmet: the upper sepal of Monkshood in this shape.

Hemi- (in compounds from the Greek): half; e. g. *Hemispherical*, &c.

Hémicarp: half-fruit, or one carpel of an Umbelliferous plant.

Herbaceous: of the texture of common herbage; not woody.

Hermaphrodite (flower): having both stamens and pistils in the same blossom; same as *perfect.*

Heterógamous: bearing two or more sorts of flowers as to their stamens and pistils; as in Aster, Daisy, and Coreopsis.
Heteromórphous: of two or more shapes.
Hexágonal: six-angled.
Hilum: the scar of the seed; its place of attachment.
Hirsute: hairy with stiffish or beard-like hairs.
Hispid: bristly: beset with stiff hairs. *Hispídulous* is a diminutive of it.
Hoary: grayish-white; see *canescent*, &c.
Homógamous: a head or cluster with flowers all of one kind, as in Eupatorium.
Homogéneous: uniform in nature; all of one kind.
Hood: same as *helmet* or *galea*. *Hooded:* hood-shaped; see *cucullate*.
Hooked: same as *hamate*.
Horn: a spur or some similar appendage. *Horny:* of the texture of horn.
Humifuse: spread over the surface of the ground.
Hýaline: transparent, or partly so.
Hybrid: a cross-breed between two allied species.
Hypocratériform: salver-shaped.
Hypogæan: produced under ground.
Hypógynous: inserted under the pistil.

Imbricate, Imbricated, Imbricative: overlapping one another, like tiles or shingles on a roof, as the scales of the involucre of Zinnia, &c., or the bud-scales of Horsechestnut and Hickory. In æstivation, where some leaves of the calyx or corolla are overlapped on both sides by others.
Immarginate: destitute of a rim or border.
Immersed: growing wholly under water.
Impari-pinnate: pinnate with a single leaflet at the apex.
Imperfect flowers: wanting either stamens or pistils.
Inæquilateral: unequal-sided, as the leaf of a Begonia.
Incanous: hoary with white pubescence.
Incised: cut rather deeply and irregularly.
Included: enclosed; when the part in question does not project beyond another.
Incomplete Flower: wanting calyx or corolla.
Incrassated: thickened.
Incumbent: leaning or resting upon: the cotyledons are incumbent when the back of one of them lies against the radicle; the anthers are incumbent when turned or looking inwards.
Incurved: gradually curving inwards.
Indefinite: not uniform in number, or too numerous to mention (over 12).
Indehíscent: not splitting open; i. e. not dehiscent.
Indígenous: native to the country.
Indúplicate: with the edges turned inwards.
Indúsium: the shield or covering of a fruit-dot of a Fern.
Inferior: growing below some other organ.
Inflated: turgid and bladdery.
Inflexed: bent inwards.
Inflorescence: the arrangement of flowers on the stem.

Infra-axillary: situated beneath the axil.
Infundĭbuliform or *Infundĭbular:* funnel-shaped.
Innate (anther): attached by its base to the very apex of the filament.
Insertion: the place or the mode of attachment of an organ to its support.
Internode: the part of a stem between two nodes.
Interruptedly pinnate: pinnate with small leaflets intermixed with larger ones, as in Water Avens.
Intrafoliaceous (stipules, &c.): placed between the leaf or petiole and the stem.
Introrse: turned or facing inwards, i. e. towards the axis of the flower.
Inverse or *Inverted:* where the apex is in the direction opposite to that of the organ it is compared with.
Involucel: a partial or small involucre.
Involúcellate: furnished with an involucel.
Involúcrate: furnished with an involucre.
Involucre: a whorl or set of bracts around a flower, umbel, or head.
Involute, in vernation: rolled inwards from the edges.

Jointed: separate or separable at one or more places into pieces.

Keel: a projecting ridge on a surface, like the keel of a boat; the two anterior petals of a papilionaceous corolla.
Keeled: furnished with a keel or sharp longitudinal ridge.
Kidney-shaped: resembling the outline of a kidney.

Labéllum: the odd petal in the Orchis Family.
Labiate: same as *bilabiate* or two-lipped.
Lacíniate: slashed; cut into deep narrow lobes (called *laciniæ*).
Lactescent: producing milky juice, as does the Milkweed, &c.
Lævigate: smooth as if polished.
Lámellar or *Lamellate:* consisting of flat plates (*lamellæ*).
Lámina: a plate or blade: the blade of a leaf, &c.
Lanate: woolly; clothed with long and soft entangled hairs.
Lanceolate: lance-shaped.
Lanuginous: cottony or woolly.
Latent buds: concealed or undeveloped buds.
Lateral: belonging to the side.
Latex: the milky juice, &c. of plants.
Lax: loose in texture, or sparse; the opposite of crowded.
Leaflet: one of the divisions or blades of a compound leaf.
Leaf-like: same as *foliaceous.*
Leathery: of about the consistence of leather; coriaceous.
Legume: a simple pod, dehiscent into two pieces, like that of the Pea, the fruit of the Pea Family (*Leguminosæ*), of whatever shape.
Lenticular: lens-shaped; i. e. flattish and convex on both sides.
Lépidote: leprous; covered with scurfy scales.
Ligneous, or *Lignose:* woody in texture.
Ligulate: furnished with a ligule.

Ligule: the strap-shaped corolla in many Compositæ, the little membranous appendage at the summit of the leaf-sheaths of most Grasses.

Limb: the blade of a leaf petal, &c.

Linear: narrow and flat, the margins parallel.

Lingulate, Linguiform: tongue-shaped.

Lip: the principal lobes of a bilabiate corolla or calyx, the odd and peculiar petal in the Orchis Family.

Lobe: any projection or division (especially a rounded one) of a leaf, &c.

Locéllus (plural *locelli*): a small cell, or compartment of a cell, of an ovary or anther.

Lócular: relating to the cell or compartment (*loculus*) of an ovary, &c.

Loculicídal (dehiscence): splitting down through the middle of the back of each cell.

Lóment: a pod which separates transversely into joints.

Lórate: thong-shaped.

Lúnate: crescent-shaped. *Lunulate:* diminutive of *lunate.*

Lýrate: lyre-shaped; a pinnatifid leaf of an obovate or spatulate outline, the end-lobe large and roundish, and the lower lobes small, as in Winter Cress and Radish.

Máculate: spotted or blotched.

Male (flowers): having stamens but no pistil.

Marcescent: withering without falling off.

Marginal: belonging to the edge or margin.

Marginate: margined, with an edge different from the rest.

Masked: see *personate.*

Median: belonging to the middle.

Medúllary: belonging to, or of the nature of pith (*medulla*); pithy.

Membranaceous or *Mémbranous:* of the texture of membrane; thin and more or less translucent.

Méricarp: one carpel of the fruit of an Umbelliferous plant.

Mésocarp: the middle part of a pericarp, when that is distinguishable into three layers.

Micropyle: the orifice of the ovule or seed.

Midrib: the middle or main rib of a leaf.

Mítriform: mitre-shaped; in the form of a peaked cap.

Monadélphous: stamens united by their filaments into one set.

Monándrous (flower): having only one stamen.

Monília form: necklace-shaped; a cylindrical body contracted at intervals.

Monochlamýdeous: having only one floral envelope, i. e. calyx but no corolla, as Anemone and Castor-oil Plant.

Monocotylédonous (embryo): with only one cotyledon.

Monœcious, or *Monoicous* (flower): having stamens or pistils only.

Monógynous (flower): having only one pistil, or one style.

Monopétalous (flower): with the corolla of one piece.

Monophýllous: one leaved, or of one piece.

Monosépalous: a calyx of one piece; i. e. with the sepals united into one body.

Monospérmous: one-seeded.
Monstrosity: an unnatural deviation from the usual structure or form.
Múcronate: tipped with an abrupt short point (*mucro*).
Mucrónulate: tipped with a minute abrupt point; a diminutive of the last.
Multi-, in composition: many; as
Multangular: many-angled. *Multicípital:* many-headed, &c.
Multifarious; in many rows or ranks. *Múltifid:* many-cleft.
Multilócular: many-celled. *Multisérial:* in many rows.
Múricate: beset with short and hard points.
Múriform: wall-like; resembling courses of bricks in a wall.
Mútícous: pointless; beardless; unarmed.

Nápiform: turnip-shaped.
Naturalized: introduced from a foreign country, but growing perfectly wild and propagating freely by seed.
Navícular: boat-shaped, like the glumes of most Grasses.
Necklace-shaped: looking like a string of beads; see *moniliform.*
Nectar: the honey, &c. secreted by glands, or by any part of the corolla.
Nectariferous: honey-bearing; or having a nectary.
Nectary: old name for petals and other parts of the flower when of unusual shape, especially when honey-bearing. So the hollow spur-shaped petals of Columbine were called nectaries; also the curious long-clawed petals of Monkshood.
Needle-shaped: long, slender, and rigid, like the leaves of Pines.
Nerve: a name for the ribs or veins of leaves, when simple and parallel.
Nerved: furnished with nerves, or simple and parallel ribs or veins.
Netted-veined: furnished with branching veins forming network.
Nodding (in Latin form, *Nutant*): bending so that the summit hangs downward.
Node: a knot; the "joints" of a stem, or the part whence a leaf or a pair of leaves springs.
Nódose: knotty or knobby. *Nódulose:* furnished with little knobs or knots.
Normal: according to rule; the pattern or natural way according to some law.
Nut: a hard, mostly one-seeded indehiscent fruit; as a chestnut, butternut, acorn.
Nutlet: a little nut; or the stone of a drupe.

Ob- (meaning over against): when prefixed to words, signifies inversion; as,
Obcompressed: flattened the opposite of the usual way.
Obcórdate: heart-shaped with the broad and notched end at the apex instead of the base.
Oblánceolate; lance-shaped with the tapering point downwards.
Oblique: applied to leaves, &c. means unequal-sided.
Oblong: from two to four times as long as broad, and more or less elliptical in outline.
Obóvate: inversely ovate, the broad end upward.
Obtuse: blunt, or round at the end.
Obverse: same as *inverse.*

Obvolute (in the bud): when the margins of one leaf alternately overlap those of the opposite one.

Ochreate: furnished with *ochreæ* (boots), or stipules in the form of sheaths; as in Polygonum.

Ochroleúcous: yellowish-white; dull cream-color.

Offset: short branches next the ground which take root.

One-ribbed, One-nerved, &c.: furnished with only a single rib, &c., &c.

Opaque, applied to a surface, means dull, not shining.

Opérculate: furnished with a lid or cover (*operculum*), as the capsules of Mosses.

Opposite: said of leaves and branches when on opposite sides of the stem from each other (i. e. in pairs). Stamens are opposite the petals, &c. when they stand before them.

Orbícular, Orbiculate: circular in outline or nearly so.

Organ: any member of the plant, as a leaf, a stamen, &c.

Orthótropous (ovule or seed): straight, the chalaza and hilum being at one end, the micropyle at the other.

Osseous: of a bony texture.

Oval: broadly elliptical.

Ovary: that part of the pistil containing the ovules or future seeds.

Ovate: shaped like an egg with the broader end downwards, or, in plane surfaces, such as leaves, like the section of an egg lengthwise.

Óvoid: ovate or oval in a solid form.

Óvule: the body which is destined to become a seed.

Palea (plural *paleæ*): chaff; the inner husks of Grasses; the chaff or bracts on the receptacle of many Compositæ, as Coreopsis, and Sunflower.

Paleaceous: furnished with chaff, or chaffy in texture.

Palmate: when leaflets or the divisions of a leaf all spread from the apex of the petiole, like the hand with the outspread fingers.

Palmately (veined, lobed, &c.): in a palmate manner.

Pánicle: an open cluster; like a raceme, but more or less compound.

Panicled, Paniculate: arranged in panicles, or like a panicle.

Papery: of about the consistence of letter-paper.

Papilionaceous: butterfly-shaped; applied to such a corolla as that of the Pea and the Locust-tree.

Papílla (plural *papillæ*): little nipple-shaped protuberances.

Papíllate, Papíllose: covered with papillæ.

Pappus: thistle-down. The down crowning the achenium of the Thistle, and other Compositæ, represents the calyx; so the scales, teeth, chaff, as well as bristles, or whatever takes the place of the calyx in this family, are called the pappus.

Parallel-veined, or *nerved* (leaves).

Parénchyma: soft cellular tissue of plants, like the green pulp of leaves.

Parietal (placentæ, &c.): attached to the walls (*parietes*) of the ovary or pericarp.

Parted: separated or cleft into parts almost to the base.

Partial involucre, same as an *involucel: partial petiole,* a division of a main

leaf-stalk or the stalk of a leaflet: *partial peduncle*, a branch of a peduncle: *partial umbel*, an umbellet.

Patent: spreading; open. *Patulous:* moderately spreading.

Pauci-, in composition: few; as *pauciflorous*, few-flowered, &c.

Pear-shaped: solid obovate, the shape of a pear.

Péctinate: pinnatifid or pinnately divided into narrow and close divisions, like the teeth of a comb.

Pedate: like a bird's foot; palmate or palmately cleft, with the side divisions again cleft, as in Viola pedata, &c.

Pedately cleft, lobed, &c.: cut in a pedate way.

Pédicel: the stalk of each particular flower of a cluster.

Pé licellate, Pédicelled: furnished with a pedicel.

Péduncle: a flower-stalk, whether of a single flower or of a flower-cluster.

Pédunčled, Pedúnculate: furnished with a peduncle.

Peltate: shield-shaped: said of a leaf, whatever its shape, when the petiole is attached to the lower side, somewhere within the margin.

Pendent: hanging. *Pendulous:* somewhat hanging or drooping.

Penicillate: tipped with a tuft of fine hairs, like a painter's pencil; as the stigmas of some Grasses.

Pepo: a fruit like the Melon and Cucumber.

Perennial: lasting from year to year.

Perfect (flower): having both stamens and pistils.

Perfóliate: passing through the leaf, in appearance.

Pérforate: pierced with holes, or with transparent dots resembling holes, as an Orange-leaf.

Périanth: the leaves of the flower generally, especially when we cannot readily distinguish them into calyx and corolla.

Péricarp: the ripened ovary; the walls of the fruit.

Perigynium: bodies around the pistil; applied to the closed cup or bottle-shaped body which encloses the ovary of Sedges, and to the bristles, little scales, &c. of the flowers of some other Cyperaceæ.

Perigynous: the petals and stamens borne on the calyx.

Persistent: remaining beyond the period when such parts commonly fall, as the leaves of evergreens, and the calyx, &c. of such flowers as remain during the growth of the fruit.

Pérsonate: masked; a bilabiate corolla with a projection, or *palate* in the throat, as of the Snapdragon.

Petal: a leaf of the corolla.

Petaloid: petal-like; resembling or colored like petals.

Pétiole: a footstalk of a leaf; a leaf-stalk.

Petioled, Petiolate: furnished with a petiole.

Petiólulate: said of a leaflet when raised on its own partial leaf-stalk.

Phænógamous, or *Phanerógamous:* plants bearing flowers and producing seeds; same as Flowering Plants.

Piliferous: bearing a slender bristle or hair (*pilum*), or beset with hairs.

Pilose: hairy; clothed with soft slender hairs.

Pinna: a primary branch of the petiole of a bipinnate or tripinnate leaf.

Pinnule: a secondary branch of the petiole of a bipinnate or tripinnate leaf.

Pínnate (leaf): when the leaflets are arranged along the sides of a common petiole.

Pinnátifid: same as pinnately cleft.

Pistil: the seed-bearing organ of the flower.

Pith: the cellular centre of an exogenous stem.

Pitted: having small depressions or pits on the surface, as many seeds.

Placénta: the surface or part of the ovary to which the ovules are attached.

Plane: flat, outspread.

Plumose: feathery; when any slender body (such as a bristle of a pappus) is beset with hairs along its sides, like the plumes or the beard on a feather.

Plúmule: the little bud or first shoot of a germinating plantlet above the cotyledons.

Pod: specially a legume, also applied to any sort of capsule.

Pointless: destitute of any pointed tip, such as a *mucro, awn, acumination,* &c.

Pollen: the fertilizing powder of the anther.

Pollen-mass: applied to the pollen when the grains all cohere into a mass, as in Milkweed and Orchis.

Poly- (in compound words of Greek origin): same as *multi-* in those of Latin origin, viz. many; as

Polyadélphous: having the stamens united by their filaments into several bundles.

Polyándrous: with numerous (more than 20) stamens (inserted on the receptacle).

Polycotylédonous: having many (more than two) cotyledons, as Pines.

Polýgamous: having some perfect and some separated flowers, on the same or on different individuals, as the Red Maple.

Polýgonal: many-angled.

Polýgynous: with many pistils or styles.

Polymórphous: of several or varying forms.

Polypetalous: when the petals are distinct or separate (whether few or many).

Pome: the apple, pear, and similar fleshy fruits.

Porous: full of holes or pores.

Pouch: the silicle or short pod, as of Shepherd's Purse.

Præmórse: ending abruptly, as if bitten off.

Prickles: sharp elevations of the bark, coming off with it, as of the Rose.

Prickly: bearing prickles, or sharp projections like them.

Prismátic: prism-shaped; having three or more angles bounding flat or hollowed sides.

Process: any projection from the surface or edge of a body.

Procumbent: trailing on the ground.

Produced: extended or projecting, as the upper sepal of a Larkspur is *produced* above into a spur.

Proliferous (literally, bearing offspring): where a new branch rises from an older one, or one head or cluster of flowers out of another, as in Filago Germanica, &c.

Prostrate: lying flat on the ground.

Prúinose, Pruinate: frosted; covered with a powder like hoar-frost.

Pubérulent: covered with fine and short, almost imperceptible down.
Pubéscent: hairy or downy, especially with fine and soft hairs or *pubescence.*
Pulvérulent, or *Pulveraceous:* dusted; covered with fine powder, or what looks like such.
Púlvinate: cushioned, or shaped like a cushion.
Punctate: dotted, either with minute holes or what look as such (as the leaves of St. John's-wort and the Orange), or with minute projecting dots.
Pungent: very hard, and sharp-pointed; prickly-pointed.
Pyramidal: shaped like a pyramid.
Pyxis, Pyxídium: a pod opening round horizontally by a lid.

Quadri-, in words of Latin origin: four; as
Quadrángular: four-angled. *Quadrifoliate:* four-leaved.
Quadrifid: four-cleft.

Raceme: a flower-cluster, with one-flowered pedicels arranged along the sides of a general peduncle.
Racemose: bearing racemes, or raceme-like.
Rachis: see *rhachis.*
Radial: belonging to the ray.
Rádiate, or *Radiant:* furnished with ray-flowers.
Rádical: belonging to the root, or apparently coming from the root.
Rádicant: rooting, taking root on or above the ground, like the stems of Trumpet-Creeper and Poison-Ivy.
Radicle: the stem-part of the embryo, the lower end of which forms the root.
Rameal: belonging to a branch. *Ramose:* full of branches (*rami*).
Rámulose: full of branchlets (*ramuli*).
Raphe: see *rhaphe.*
Ray: the marginal flowers of a head (as of Coreopsis), or cluster (as of Hydrangea), when different from the rest, especially when ligulate, and diverging (like rays or sunbeams); the branches of an umbel, which diverge from a centre.
Receptacle: the axis or support of a flower; the common axis or support of a head of flowers.
Reclined: turned or curved downwards; nearly recumbent.
Recurved: curved outwards or backwards.
Redúplicate (in æstivation): valvate with the margins turned outwards.
Reflexed: bent outwards or backwards.
Refracted: bent suddenly, so as to appear broken at the bend.
Regular: all the parts similar.
Réniform: kidney-shaped.
Repánd: wavy-margined.
Répent: creeping, i. e. prostrate and rooting underneath.
Réplum: the persistent frame of some pods (as of Prickly Poppy and Cress), after the valves fall away.
Reproduction: organs of: all that pertains to the flower and fruit.
Resúpinate: inverted, or appearing as if upside down, or reversed.

Reticulated: the veins forming network.
Retroflexed: bent backwards; same as *reflexed.*
Retúse: blunted; the apex not only obtuse, but somewhat indented.
Révolute: rolled backwards, as the margins of many leaves.
Rhachis (the backbone): the axis of a spike, or other body.
Rhaphe: the continuation of the seed-stalk along the side of an anatropous ovule or seed.
Rháphides: crystals, especially needle-shaped ones, in the tissues of plants.
Rhizóma: a rootstock.
Rhombic: in the shape of a rhomb. *Rhomboidal:* approaching that shape.
Rib: the principal piece, or one of the principal pieces, of the framework of a leaf, or any similar elevated line along a body.
Rúngent: grinning; gaping open.
Rootlets: small roots, or root-branches.
Rootstock: root-like trunks or portions of stems on or under ground.
Rosaceous: arranged like the petals of a rose.
Rostéllate: bearing a small beak (*rostellum*).
Róstrate: bearing a beak (*rostrum*) or a prolonged appendage.
Rósulate: in a regular cluster of spreading leaves, resembling a full or double rose, as the leaves of Houseleek, &c.
Rótate: wheel-shaped.
Rotund: rounded or roundish in outline.
Rudimentary: imperfectly developed, or in an early state of development.
Rúgose: wrinkled, roughened with wrinkles.
Rúminated (albumen): penetrated with irregular channels or portions filled with softer matter, as a nutmeg.
Rúncinate: coarsely saw-toothed or cut, the pointed teeth turned towards the base of the leaf, as the leaf of a Dandelion.
Runner: a slender and prostrate branch, rooting at the end, or at the joints, as of a Strawberry.

Sac: any closed membrane, or a deep purse-shaped cavity.
Ságittate: arrowhead-shaped.
Salver-shaped, or *Salver-form:* with a border spreading at right angles to a slender tube, as the corolla of Phlox.
Samára: a wing-fruit, or key, as of Maple, Ash, and Elm.
Sámaroid: like a samara or key-fruit.
Sap: the juices of plants generally. Ascending or crude sap. Elaborated sap, that which has been digested or assimilated by the plant.
Sárcocarp: the fleshy part of a stone-fruit.
Sarmentáceous: bearing long and flexible twigs (*sarments*), either spreading or procumbent.
Saw-toothed: see *serrate.*
Scábrous: rough or harsh to the touch.
Scalári form: with cross-bands, resembling the steps of a ladder.
Scales: of buds, of bulbs, &c.
Scaly: furnished with scales, or scale-like in texture.
Scandent: climbing.

Scape: a peduncle rising from the ground, or near it, as of the stemless Violets, the Bloodroot, &c.

Scápiform: scape-like.

Scárious, or *Scariose:* thin, dry, and membranous.

Scorpioid, or *Scorpioidal:* curved or circinate at the end, like the tail of a scorpion, as the inflorescence of Heliotrope.

Scrobículate: pitted; excavated into shallow pits.

Scurf, *Scurfiness:* minute scales on the surface of many leaves, as of Goose-foot, Buffalo-berry, &c.

Scútate: buckler-shaped.

Scutéllate, or *Scutéliform:* saucer-shaped or platter-shaped.

Sécund: one-sided; i. e. where flowers, leaves, &c. are all turned to one side.

Segment: a subdivision or lobe of any cleft body.

Ségregate: separated from each other.

Semi- (in compound words of Latin origin): half; as

Semi-adherent, as the calyx or ovary of Purslane. *Semi-cordate:* half-heart-shaped. *Semilunar:* like a half-moon. *Semi-ovate:* half-ovate, &c.

Sepal: a leaf or division of the calyx.

Sépaloid: sepal-like.

Separated Flowers: those having stamens or pistils only.

Septate: divided by partitions (*septa*).

Septicídal: where a pod in dehiscence splits through the partitions, dividing each into two layers.

Septífragal: where the valves of a pod in dehiscence break away from the partitions.

Septum (plural *septa*): a partition, as of a pod, &c.

Sérial or *Seriate:* in rows; as *biserial*, in two rows, &c.

Seríceous: silky; clothed with satiny pubescence.

Serótinous: happening late in the season.

Serrate, or *Serrated:* the margin cut into teeth (*serratures*) pointing forwards.

Sérrulate: same as the last, but with fine teeth.

Sessile: sitting; without any stalk, as a leaf destitute of petiole, or an anther destitute of filament.

Seta: a bristle, or a slender body or appendage resembling a bristle.

Setáceous: bristle-like. *Sétiform:* bristle-shaped.

Setígerous; bearing bristles. *Setose:* beset with bristles or bristly hairs.

Sheath: the base of such leaves as those of Grasses, which are

Sheathing: wrapped round the stem.

Shield-shaped: same as *scutate*, or as *peltate*.

Sígmoid: curved in two directions, like the letter S, or the Greek *sigma*.

Sílicle: a pouch, or short pod of the Cress Family.

Silículose: bearing a silicle, or a fruit resembling it.

Silíque: a longer pod of the Cress Family.

Síliquose: bearing siliques or pods which resemble siliques.

Silky: glossy with a coat of fine and soft, close-pressed, straight hairs.

Silvery: shining white or bluish-gray, usually from a silky pubescence.

Simple: of one piece; opposed to *compound*.

Sinistrorse: turned to the left.

Sínuate: strongly wavy; with the margin alternately bowed inwards and outwards.

Sínus: a recess or bay; the re-entering angle or space between two lobes or projections.

Soboliferous: bearing shoots from near the ground.

Solitary: single; not associated with others.

Sorus (plural *sori*): the proper name of a fruit-dot of Ferns.

Spadix: a fleshy spike of flowers.

Spathaceous: resembling or furnished with a

Spathe: a bract which inwraps an inflorescence.

Spátulate, or *Spathulate:* shaped like a spatula.

Spicate: belonging to or disposed in a spike.

Spíciform: in shape resembling a spike.

Spike: an inflorescence like a raceme, only the flowers are sessile.

Spikelet: a small or a secondary spike; the inflorescence of Grasses.

Spine: a thorn.

Spindle-shaped: tapering to each end, like a radish.

Spinescent: tipped by or degenerating into a thorn.

Spinose, or *Spiniferous:* thorny.

Sporángia, or *Spórocarps:* spore-cases of Ferns, Mosses, &c.

Spore: a body resulting from the fructification of Cryptogamous plants, in them taking the place of a seed.

Spur: any projecting appendage of the flower, looking like a spur, as that of Larkspur.

Squamate, Squamose, or *Squamaceous:* furnished with scales (*squamæ*).

Squamellate, or *Squámulose:* furnished with little scales (*squamellæ* or *squamulæ*).

Squámiform: shaped like a scale.

Squarrose: where scales, leaves, or any appendages, are spreading widely from the axis on which they are thickly set.

Squárrulose: diminutive of *squarrose;* slightly squarrose.

Stalk: the stem, petiole, peduncle, &c., as the case may be.

Staminate: furnished with stamens. *Stamineal:* relating to the stamens.

Staminódium: an abortive stamen, or other body resembling a sterile stamen.

Standard: the upper petal of a papilionaceous corolla.

Station: the particular place, or kind of situation, in which a plant naturally occurs.

Stéllate, Stéllular: starry or starlike; where several similar parts spread out from a common centre, like a star.

Stemless: destitute or apparently destitute of stem.

Sterile: barren or imperfect.

Stigma: the part of the pistil which receives the pollen.

Stigmátic, or *Stígmatose:* belonging to the stigma.

Stipe (Latin *stipes*): the stalk of a pistil, &c., when it has any; the stem of a Mushroom.

Stipel: a stipule of a leaflet, as of the Bean, &c.

Stipéllate: furnished with stipels, as the Bean and some other Leguminous plants.

Stípitate: furnished with a stipe, as the pistil of Cleome.
Stípulate: furnished with stipules.
Stipules: the appendages on each side of the base of certain leaves.
Stolons: trailing or reclined and rooting shoots.
Stoloníferous: producing stolons.
Stomate (Latin *stoma*, plural *stomata*): the breathing-pores of leaves, &c.
Strap-shaped: long, flat, and narrow.
Striate, or *Striated:* marked with slender longitudinal grooves or channels (Latin *striæ*).
Strict: close and narrow; straight and narrow.
Strigíllose, Strígose: beset with stout and appressed, scale-like or rigid bristles.
Strobiláceous: relating to, or resembling a
Stróbile: a multiple fruit in the form of a cone or head, as that of the Hop and of the Pine.
Stróphiole: same as *caruncle*. *Strophiolate:* furnished with a strophiole.
Struma: a wen; a swelling or protuberance of any organ.
Style: a part of the pistil which bears the stigma.
Stylopódium: an epigynous disk, or an enlargement at the base of the style, found in Umbelliferous and some other plants.
Sub-, as a prefix; about, nearly, somewhat; as *subcordate*, slightly cordate: *subserrate*, slightly serrate: *subaxillary*, just beneath the axil, &c., &c.
Súberose: corky or cork-like in texture.
Súbulate: awl-shaped; tapering from a broadish or thickish base to a sharp point.
Succulent: juicy or pulpy.
Suckers: shoots from subterranean branches.
Suffrutéscent: slightly shrubby or woody at the base only.
Sulcate: grooved longitudinally with deep furrows.
Supérvolute: plaited and convolute in bud.
Supra-axillary: borne above the axil, as some buds.
Súrculose: producing suckers, or shoots resembling them.
Suspended: hanging down. Suspended ovules or seeds hang from the very summit of the cell which contains them.
Súture: the line of junction of contiguous parts grown together.
Sword-shaped: vertical leaves with acute parallel edges, tapering above to a point; as those of Iris.
Symmetrical Flower: similar in the number of parts of each set.
Synántherous, or *Syngenesious:* where stamens are united by their anthers.
Syncárpous (fruit or pistil): composed of several carpels consolidated into one.

Taper-pointed: same as *acuminate*.
Tap-root: a root with a stout tapering body.
Tawny: dull yellowish, with a tinge of brown.
Tendril: a thread-shaped body used for climbing; it is either a branch, as in Virginia Creeper, or a part of a leaf, as in Pea and Vetch.
Térete: long and round; same as *cylindrical*, only it may taper.
Términal: borne at, or belonging to, the extremity or summit.
Ternate: in threes; *Ternately:* in a ternate way.

Testa: the outer (and usually the harder) coat or shell of the seed.

Tetra- (in words of Greek composition): four; as,

Tetracóccous: of four cocci or carpels.

Tetradýnamous: where a flower has six stamens, two of them shorter than the other four, as in Mustard.

Tetrágonal: four-angled. *Tetrágynous:* with four pistils or styles.

Tetrámerous: with its parts or sets in fours.

Tetrandrous: with four stamens.

Theca: a case; the cells or lobes of the anther.

Thorn: see *spine.*

Thread-shaped: slender and round, or roundish like a thread; as the filament of stamens generally.

Throat: the opening or gorge of a monopetalous corolla, &c., where the border and the tube join, and a little below.

Thyrse, or *Thyrsus:* a compact and pyramidal panicle.

Tómentose: clothed with matted woolly hairs (*tomentum*).

Tongue-shaped: long, flat, but thickish, and blunt.

Toothed: furnished with teeth or short projections of any sort on the margin used especially when these are sharp, like saw-teeth, and do not point forwards.

Top-shaped: shaped like a top, or a cone with its apex downwards.

Tórose, Tórulose: knobby; where a cylindrical body is swollen at intervals.

Torus: the receptacle of the flower.

Tri-, in composition: three; as

Triadelphous: stamens united by their filaments into three bundles.

Triándrous: where the flower has three stamens.

Trichótomous: three-forked. *Tricóccous:* of three cocci or roundish carpels.

Trícolor: having three colors. *Tricóstate:* having three ribs.

Tricúspidate: three-pointed. *Tridéntate:* three-toothed.

Triénnial: lasting for three years.

Trifid: three-cleft.

Trifoliate: three-leaved. *Trifóliolate:* of three leaflets.

Triforcate: three forked. *Trígonous:* three-angled, or triangular.

Trígynous: with three pistils or styles. *Trijugate:* in three pairs (*jugi*).

Trilóbed, or *Trilobate:* three-lobed.

Trilócular: three-celled.

Trimerous: with its parts in threes, as Trillium.

Trinérvate: three-nerved, or with three slender ribs.

Triœcious: where there are three sorts of flowers on the same or different individuals; as in Red Maple.

Triphýllous: three-leaved; composed of three pieces.

Tripínnate: thrice pinnate; *Tripinnátifid:* thrice pinnately cleft.

Triple-ribbed, Triple-nerved, &c.: where a midrib branches into three near the base of the leaf, as in Sunflower.

Triquétrous: sharply three-angled; and especially with the sides concave, like a bayonet.

Trisérial, or *Triseriate:* in three rows, under each other.

Tristíchous: in three longitudinal or perpendicular ranks.

Trisúlcate: three-grooved.

Tritérnate: three times ternate.
Trumpet-shaped: tubular, enlarged at or towards the summit, as the corolla of Trumpet-Creeper.
Truncate: as if cut off at the top.
Trunk: the main stem or general body of a stem or tree.
Tuber: a thickened portion of a subterranean stem or branch, provided with eyes (buds) on the sides; as a potato.
Túbercle: a small excrescence.
Tubercled, or *Tuberculate:* bearing excrescences or pimples.
Túberous: resembling a tuber. *Tuberíferous:* bearing tubers.
Túbular: hollow and of an elongated form; hollowed like a pipe.
Tumid: swollen; somewhat inflated.
Túnicate: coated; invested with layers, as an onion.
Túrbinate: top-shaped. *Turgid:* thick as if swollen.
Turnip-shaped: broader than high, abruptly narrowed below.
Twin: in pairs (see *geminate*).
Twining: ascending by coiling round a support, like the Hop.
Typical: well expressing the characteristics of a species, genus, &c.

Úmbel: the umbrella-like form of inflorescence.
Umbéllate: in umbels. *Umbellíferous:* bearing umbels.
Úmbellet: a secondary or partial umbel.
Umbílicate: depressed in the centre, like the ends of an apple.
Úmbonate: bossed; furnished with a low, rounded projection like a boss (*umbo*).
Unarmed: destitute of spines, prickles, and the like.
Úncinate: hook-shaped; hooked over at the end.
Under-shrub: partially shrubby, or a very low shrub.
Úndulate: wavy, or wavy-margined.
Unequally pinnate: pinnate with an odd number of leaflets.
Unguículate: furnished with a claw (*unguis*); i. e. a narrow base, as the petals of a Rose, where the claw is very short, and those of Pinks, where the claw is very long.
Uni-, in compound words: one; as
Uniflórous: one-flowered. *Unifóliate:* one-leaved.
Unifóliolate: of one leaflet. *Unijugate:* of one pair.
Unilábiate: one-lipped. *Unilateral:* one-sided.
Unilócular: one-celled.
Uniövulate: having only one ovule.
Unisérial: in one horizontal row.
Uniséxual: having stamens or pistils only, as in Moonseed.
Únivalved: a pod of only one piece after dehiscence.
Urcéolate: urn-shaped.
Útricle: a small, thin-walled, one-seeded fruit, as of Goosefoot.
Utrícular: like a small bladder.

Váginate: sheathed, surrounded by a sheath (*vagina*).
Valve: one of the pieces (or doors) into which a dehiscent pod, or any similar body, splits.

Valvate, Válvular: opening by valves. *Valvate* in æstivation.
Váscular: containing vessels, or consisting of vessels, such as ducts.
Vaulted: arched; same as *fornicate.*
Veins: the small ribs or branches of the framework of leaves, &c.
Veined, Veiny: furnished with evident veins. *Veinless:* destitute of veins.
Veinlets: the smaller ramifications of veins.
Velútinous: velvety to the touch.
Venation: the veining of leaves, &c.
Vénose: veiny; furnished with conspicuous veins.
Ventral: belonging to that side of a simple pistil, or other organ, which looks towards the axis or centre of the flower; the opposite of dorsal; as the
Véntricose: inflated or swelled out on one side.
Vermícular: shaped like worms.
Vernation: the arrangement of the leaves in the bud.
Vérrucose: warty; beset with little projections like warts.
Versatile: attached by one point, so that it may swing to and fro, as the anthers of the Lily and Evening Primrose.
Vertex: same as the *apex.*
Vértical: upright; perpendicular to the horizon, lengthwise.
Vérticil: a whorl. *Verticillate:* whorled.
Vésicle: a little bladder. *Vesicular:* bladdery.
Vexillary, Vexillar: relating to the
Vexillum: the standard of a papilionaceous flower.
Villose: shaggy with long and soft hairs (*villosity*).
Vimíneous: producing slender twigs, such as those used for wicker-work.
Vine: any trailing or climbing stem; as a Grape-vine.
Viréscent, Viridescent: greenish; turning green.
Vírgate: wand-shaped, as a long, straight, and slender twig.
Viscous, Viscid: having a glutinous surface.
Vitta (plural *vittæ*): the oil-tubes of the fruit of Umbelliferæ.
Vóluble: twining, as the stem of Hops and Beans.

Wavy: the surface or margin alternately convex and concave.
Waxy: resembling beeswax in texture or appearance.
Wedge-shaped: broad above, and tapering by straight lines to a narrow base.
Wheel-shaped: see *rotate.*
Whorl, Whorled: when leaves, &c. are arranged in a circle round the stem.
Wing: any membranous expansion. *Wings* of papilionaceous flowers.
Winged: furnished with a wing; as the fruit of Ash and Elm.
Woolly: clothed with long and entangled soft hairs; as the leaves of Mullein.

THE END.

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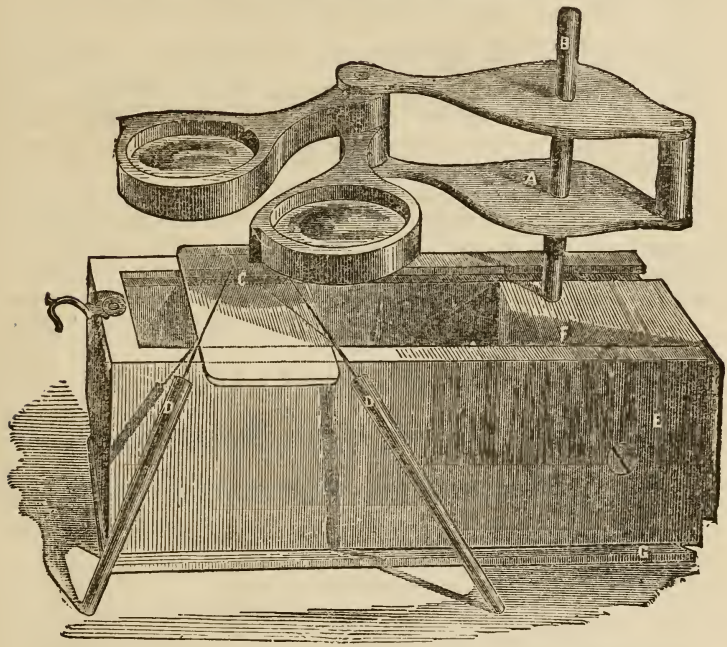

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